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HERBACEOUS
PERENNIALS



HERBACEOUS PERENNIAL PLANTS may add color to home-ground plantings comparable with that produced by annual flowers. By a proper selection of kinds a succession of bloom is possible from early spring to late fall. A wise choice will provide flowers at times when the shrubs are out of bloom.

The kinds usually catalogued by dealers in herbaceous perennials are adapted primarily to cool, moist regions, but there are many other kinds, especially among native plants, that may be satisfactorily grown in the warmer and also in the drier parts of the United States.

In home-ground planting they may be used either as specimens or clumps in pockets or bays of the shrubbery, but may also be used in long, narrow beds of their own or slightly mixed with shrubs and spoken of as borders.

These borders may be straight and formal, as would be the case in a narrow strip between a path and a boundary, or they may be irregular in outline, as often seen in front of irregular masses of shrubbery.

The planting usually consists of irregular groups and masses, although occasionally plantings may be formally arranged.

They should not be used for a flower bed in the middle of a lawn.

In addition to being used as part of the decorative plantings about the home, they may also be used in general garden development and in special places, such as rock gardens, wall gardens, fern gardens, cactus gardens, bog gardens, and the like. Some kinds can also be used for cut flowers.

Selections must be made of those adapted to each section of the country, to the type of garden or other planting in mind, as well as the season when flowers are most desired.

They respond to good culture, and most of them should be divided and reset every three or four years. Many kinds can be satisfactorily started from seed.

HERBACEOUS PERENNIALS.

By FURMAN LLOYD MULFORD, *Horticulturist, Office of Horticultural Investigations, Bureau of Plant Industry.*

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HARDY PERENNIAL PLANTS.

IN THE AWAKENING of nature after an enforced rest due either to cold winters or dry summers, herbaceous perennial plants bring the first green and brightness to the landscape. The re-



FIG. 1.—*Hepatica*. An early spring flower that blooms from buds formed the previous autumn.

sponse of these plants is even more prompt than that of the most responsive of the trees and shrubs. They throw out leaves and showy flowers as soon as the more modest flowers of the earliest woody plants appear and weeks in advance of plants grown from

seed. This is due to the ability of the herbaceous perennials to store up material the previous season upon which they can draw for a quick start upon the return of favorable conditions. It is the revival of those flowers that lie dormant over winter in cold countries (fig. 1) or through the dry season in arid and semiarid regions that gives the first proof of the return of the growing season.

The earliness and showy flowers of hardy perennials give them a field of their own in home-ground decoration. In addition to this, both early and late flowering kinds are of easy culture and are relatively permanent, so that they can be used with satisfaction about farm, suburban, and city homes (fig. 2) where only a little time can be devoted to the care of plants.



FIG. 2.—Iris and phlox used effectively about a city home.

In nature, trees are found growing crowded closely together in the woods while in the open country they may be scattered here and there in the fields or along the streams. Associated with the trees or forming clumps and thickets of their own are shrubs, which are woody plants of lower growth. Such plants, with the grasses, are the main features of most landscapes. In addition to these are other plants the tops of which die to the ground each year and, like the grasses, come the next season, some from seed and some from roots that have lived over winter or through the dry season. All of these soft-stemmed plants which do not form hard, woody tops are spoken of as herbaceous plants. Those that die after one season's growth are called annuals; those that continue growth for two seasons, biennials; while those that grow three or more seasons are perennials. Biennials and perennials have flowering stems either with or without foliage and usually foliage directly from the root.

In temperate regions the stems die to the ground each year and often the root leaves die also. In humid tropical countries, however, they may continue to grow from year to year. Many herbaceous plants, both annuals and perennials, have showy flowers that give color to the landscape.

In making the home surroundings comfortable and beautiful, man has utilized trees to give shade, and some of the showiest annuals, such as scarlet sage and petunias, and also tropical perennials, like the geraniums and cannas, to add color. Many other plants, such as hardy bulbs and herbaceous perennials, have been used in gardens or under special conditions, but their use has not been as general as it should be. This is probably from a lack of understanding of the methods of culture as well as a failure to appreciate the usefulness and beauty of the plants. In the following pages the at-



FIG. 3.—A well-planned garden of herbaceous perennials.

tempt is made to give an idea of the appropriate use of some herbaceous perennials and to include directions for their culture.

In garden parlance the term "annual" is used for those flowering or foliage plants that give satisfactory results in a single season from seed, as petunia, zinnia, sweet alyssum, and castor-bean. The term "tender plant" applies to those natives of warm countries that do not withstand freezing or frost and so must be wintered indoors. Among these are shrubs, such as geraniums and lantanas; herbaceous perennials, such as coleus and begonias; and fleshy rooted plants, such as cannas and dahlias. Hardy herbaceous perennials, or hardy perennials as they are more frequently called, are those flowering or foliage plants whose roots will live from year to year, although their soft or fleshy tops may or may not die to the ground each year. Examples of these are peonies, iris, columbine, and many lilies.

Sometimes the distinctions between annual, biennial, and perennial plants are arbitrary, as in the case of plants that bloom well the

first season from seed and yet are perennial; as, for example, the snapdragon and the pansy. In both these cases, however, better bloom is obtained from plants raised anew each year than from older ones.

There are also other plants that do best if grown each year from seed but need to be planted not later than midsummer for bloom the following year. These are called biennials, even though the life cycle may be completed within a year. The seed of many plants such as sweet-william, foxglove, and hollyhock if sown as soon as ripe will produce flowering plants the next summer.

USE OF HERBACEOUS PERENNIALS.

Herbaceous perennials may be used very much like annuals¹ to add the color of flowers to permanent shrubbery plantations.² and



FIG. 4.—A water garden, with herbaceous perennials on the banks as well as in the water.

they may also be used in garden making either alone or with other classes of plants (fig. 3). Because of the time it takes to grow them or the expense of purchase they are not suited for producing temporary effects in the way that annuals are sometimes used. Shrubs are so readily established in their appropriate places that no advantage is gained by substituting herbaceous perennials for them. Neither annuals nor herbaceous perennials give the idea of stability and permanence that is produced by woody plants, as in winter most perennials are no more effective than annuals. In garden making, perennials have the advantage of relative permanence, as when once

¹ See Farmers' Bulletin 1171, Growing Annual Flowering Plants.

² The appropriate location of shrubbery groups is described in Farmers' Bulletin 1087, Beautifying the Farmstead.

planted most of them do not need to be reset for three years or more, and when transplanted a majority of them can be subdivided, thereby increasing the plantations if desired. Many of them produce their flowers in the spring before the annuals have gotten above the ground, and many more produce a wealth of bloom in late summer or fall. There are few, however, that bloom in midsummer, so that where abundance of bloom is wanted at that season it is frequently necessary to use annuals with the perennials.

To be satisfactory, herbaceous perennials must be able to withstand adverse conditions either winter or summer in the place where they are grown. Naturally those plants native to a region, or native to a region with similar climatic conditions, are most likely to succeed. Fortunately there are many desirable plants in all sections of the country that can be cultivated and give excellent results, as,



FIG. 5.—A herbaceous garden with formal arrangement but informal planting.

for example, various species of violets, phlox, trilliums, rudbeckias, sedums, yuccas, columbines, asters, and goldenrods. These native plants form fully as important a part in the list of hardy perennials as the introduced plants, although probably none of them is so widely cultivated as some of the introduced ones, such as peonies and irises. One reason for the great popularity of these plants is the large number of attractive varieties that have been produced as a result of centuries of cultivation, selection, and breeding. There is every reason to expect as great a development in some of our native plants as in these. Already the phlox and the graceful attractive aster have many cultivated forms which are an improvement on the wild ones, and the betterment of other plants has begun.

By the introduction of perennials anywhere in the United States it is possible to add touches of desirable color to the permanent tree and shrub plantings. Likewise, an attractive flower garden or a border may be made up of these plants obtained from the wild.

Roots of the plants may be collected, many of them may be grown from seed, or they may be purchased from nurserymen who specialize in them. Some of the rarer kinds must be purchased from collectors.

In using hardy perennials for adornment of the home grounds, they should be planted in irregular clumps at appropriate openings in the shrubbery groups, but not in bands or ribbons either along the shrubbery, the foundation of the house, or the borders of the lawn. In flower gardens they may be appropriately planted in straight or curved lines if that is in harmony with the garden design.

Herbaceous perennials are adapted to a wide range of conditions. A few are found wild, with their roots growing in water-soaked soil. Others are found on rocky cliffs or hillsides. Others again are



FIG. 6.—A border of formal outline.

found on rich bottom lands, while still others thrive on poor, gravelly, or sandy soils. These natural habitats suggest some of the places in which the plants may be appropriately cultivated. Fortunately, however, many of the plants succeed under a wide range of conditions other than those suggested by the natural conditions under which they are found growing. For example the rosemallow, usually found in wet places, succeeds in good garden soil of average moisture content. On the other hand, columbines usually grow on rocky hillsides, but can be grown almost anywhere except in marshy places.

ARRANGEMENT.

Perennials lend themselves effectively to different types of planting, including formal and informal gardens, borders, among shrubbery, about buildings and lawns, and naturalized in meadows and woodlands. They are also most important in developing gardens of

special types or for special situations, as water gardens (fig. 4), bog gardens, rock gardens, wall gardens, woodland gardens, and fern gardens, as well as seasonable gardens, such as June gardens, September gardens, and so on.

FORMAL AND INFORMAL GARDENS.

In formal gardens the design or outline is of paramount importance, and the planting must be subservient to it; that is, it must help to show the design and not to hide or disguise it. In this type of garden straight or curved lines must often be more or less accurately reproduced in foliage or flower masses. The number of plants that lend themselves readily to the control necessary to produce the desired results are less numerous than those adapted to less formal



FIG. 7.—An informal border.

plantings. Sometimes the plant effects may be informal, even though the garden design is formal (fig. 5). Such a design is often spoken of as "an old-fashioned garden" or "a grandmother's garden." Here the planting is more like that in borders, although often the groupings in individual beds may be practically all of the same height, instead of the plants increasing in height from the walk toward the center, each bed being of such a height as to produce the garden effect desired. Usually the outer beds are taller than those in the middle; then again each bed may be graded from the walk toward its center, the latter being by far the most usual method, even where the highest plants in the different beds increase from the inner beds to the border ones. The general handling in the garden is much the same as in borders.

Garden paths should be liberal in width, as it makes them more effective in the design and more convenient to use. No encroachment of plants may be permitted along narrow paths without mak-

ing them uncomfortable for passing. Even where low plants are used along the walks the effect of liberal paths is more pleasing.

The material used for the surface of garden paths has an important influence on the impression the garden produces. Sometimes gravel, brick, or even concrete walks may be appropriate, but more often turf walks are better, or turf with irregular stepping-stones. A good garden can be made by secluding a turf panel with appropriate plantings or walls and then developing beds in the turf, permitting most of the area to remain in grass.

BORDERS.

Borders are beds more or less closely paralleling boundaries, shrubbery plantings, walks, drives, or other features of the landscape.



FIG. 8.—Narrow beds well utilized, with herbaceous perennials used alone on the left and among shrubs on the right.

They may be of regular or formal outline (fig. 6), irregular in the extreme (fig. 7), or intermediate. The plantings, too, may be formal or informal, although they are more often informal even when the beds are formal.

The plantings in borders should be low in front and high in the back. The relation of these in feet depends upon the width and length of the bed, the background, the character of the foreground, and the relation to other parts of the landscape. Ordinarily it is not desirable to use plants that grow taller than half the width of the bed, especially where a little crowding over the edge would be objectionable, as would be the case in a narrow bed between a walk and a fence. In such a case vines might possibly be used on the fence in lieu of taller plants that might extend farther forward over the walk, thus getting a combination of a background and some of the effect which taller plants in the bed might produce. In long, wide

borders increased attractiveness may often be gained by using an occasional tall plant near the front of the bed, but this should be the exception, and even then it should not be so near the front as to extend over the edge of the walk.

In formal borders plants of a kind would be arranged in long lines paralleling the edges, but in informal borders the most effective results are obtained by having the different kinds arranged in groups or clumps. Those of similar heights should be planted at varying distances from the front, so as not to make bands too decided in the planting. Likewise, plants differing in other characters should also be used to assist in giving more variety, as those with different shapes or texture of foliage or with different colors of flowers.

The width of borders will depend upon the surrounding conditions. While no space is too small to utilize (fig. 8), for really satisfactory results 5 feet is needed, and from this to 20 feet or more



FIG. 9.—An adequate path between a herbaceous border and a rose-covered fence.

is best for full development. Effective results can be obtained on very small areas when properly handled, the method of treatment being more important than the area of ground available. In narrow beds, formal planting is often the most appropriate. In wide borders provision may be made among the plants for narrow work paths, which may be largely hidden by the foliage. This makes cultivation of the plants more convenient without running over the beds indiscriminately. A bed 5 feet wide is as large as can be well worked without going into it, so that for ease of handling, paths should be provided at not to exceed this distance apart. These paths may be well defined or may be mere trails.

Where paths and borders are used in conjunction it is important that the path be of liberal width, but what constitutes liberality of

width is difficult to state in feet, because conditions vary. Esthetically, paths include graveled, turfed, or paved areas, or some narrow hard surface with a border of turf. For a service walk in a small back yard 3 feet is not too liberal, while 8 feet may not be too wide on a larger place (fig. 9). As in gardens, the plants need to be kept back so that they do not overhang the walks unduly.

The apparent width of walks may be increased by the use of dwarf plants in the foreground of plantings. The use of such plants is desirable even for the edge of plantings next to lawns. Many of these do not attain a height of more than 4 inches, and others are but a trifle taller.

In addition to the foreground that may be provided either by a walk or by the open lawn (fig. 10), borders need a suitable background to be most pleasing. In restricted areas this may sometimes



FIG. 10.—A herbaceous border with an open lawn as a foreground and a background largely of vines.

be a fence with or without vines, but it should be painted a neutral tint so as to be as inconspicuous as possible. Where space permits, tall-growing plants may be used in front of such a fence or of other backgrounds. Evergreen trees or shrubs, when they are available, make most effective backgrounds, while deciduous plants (fig. 11) are also useful for this purpose.

GROWTH AMONG SHRUBBERY.

When used among shrubbery, herbaceous perennials should be placed here and there in clumps, where there are spaces sufficiently large for them to develop properly. It adds to the floral effect if bays or pockets are left when the woody plants are set, and these are

then filled with suitable perennials. Sometimes use may be made of taller growing plants which at their season may reach above the surrounding shrubs, revealing a mass of flowers where otherwise no color would be provided in summer or fall. The shrubs also serve to shield such plants from the effects of winds, thus acting as partial supports for them. Low-growing perennials may be used as foregrounds or borders and larger ones farther back or in pockets that



FIG. 11.—A herbaceous border with a good background of deciduous woody plants.

extend into the shubbery some distance and yet are sufficiently open to the edge for the plantings to be seen.

The kinds that succeed best are the more robust ones that are somewhat comparable with those that naturalize well, as ordinarily the care of shrubbery borders is not as intensive as that of herbaceous borders. If there is no reason why intensive culture should not be given, any of the perennials may be used. Consideration must always be given to the shade to which the plants may be subjected and the selections made with that in mind.

NATURALIZED PLANTINGS.

Many vigorous-growing herbaceous perennials will maintain themselves with little attention under conditions similar to those under which they grow wild. Planting in this way is spoken of as naturalizing and is frequently very effective. The arrangement of such plants must be irregular in the extreme, a few plants scattered in one place, a few more in another, with here and there plants singly or by twos, and in other places large masses of them.

ROCK GARDENS.

A rock garden is a special form of perennial garden where dwarf herbaceous perennials and low-growing woody plants are grown amid rocks. They can be developed wherever there is an abundance



FIG. 12.—A well-executed rock garden on soil where rocks do not naturally occur.

of rocks at hand. Natural locations for such gardens are old quarries and rocky ledges. Such conditions can be reproduced by a naturalistic arrangement of rocks on a gravelly or other well-drained soil (fig. 12). At times they are constructed at considerable expense where there are no natural outcroppings of stone, but it takes an expert to do this sort of thing successfully. A round or conical pile of stones in the middle of a lawn or elsewhere is in no sense a rock garden even though at times it has been dignified by the name of "rockery" (fig. 13), for such an arrangement is formal and rock gardens are always informal. On the other hand, boulders scattered in a bank or flat stones so placed as to simulate rock ledges may be an appropriate foundation for a rock garden.

The plants used are mostly herbaceous, either perennials or annuals, with a few shrubs to give a proper setting. Those classed in catalogues as rock plants are mostly such as are adapted to the cool, moist regions of the northeastern United States and the Puget Sound country. For warmer, drier situations the succulents so useful in the southwest need to be used, such as sedums or stone-crops, cacti of several kinds, and yuccas.

Rock plants are mostly sun loving and are easily grown if not disturbed about the roots by cultivation and not overmulched. Weeds must be kept out by timely pulling, but their growth can be retarded by poor soil in which rock plants are at home. Most of the



FIG. 13.—A rockery. A frequently attempted substitute for a rock garden which, like other substitutes, is never pleasing.

so-called rock-garden plants, aside from the succulents, require copious waterings when the seasons are hot and dry.

WALL GARDENS.

The step from a bank held by scattered rocks to a rock wall (fig. 14) is a short one. The latter, when made with the intention of growing plants, is built without mortar but with pockets filled with earth between the stones. A wall without mortar is called a "dry wall" and preferably should be built with a marked batter or slope to the face. Such a wall should be constructed of large stones, and often it is more effective if irregular, especially where informal effects are desired. Better results are likely to be obtained by using intelligent day laborers rather than regular masons, as the latter

are so intent on building a straight, smooth wall with the chinks all filled that it may prove to be a failure as the foundation for a rock garden.

A mason would probably feel that his reputation as an artisan would be ruined if he built a wall sufficiently irregular to be a really good informal rock wall. The builders of such walls require "garden sense" rather than "structural sense," and it is remarkable how seldom the two go together. Often dry walls may be utilized where formal lines are desired, either in formal gardens or elsewhere, in which case a mason would probably best be employed, but constant supervision would be needed to have the earth openings left sufficiently large and to prevent the filling of chinks with relatively



FIG. 14.—A rock wall. An effective and ornamental method of holding banks.

small stones. The first or bottom row of stones is laid with spaces between them. These should be filled with good soil that is firmly tamped into place. A space back of the stones should also be filled with good soil. After this is done, another layer of stones is placed on the first layer, the second row covering the openings in the first row with the faces of the stones set back a little toward the bank. If these faces are irregular and jagged, so much the better. The spaces between these are also filled with soil, and the process is repeated until the wall is finished. Many of the smaller rock plants and succulents are adapted for planting in the pockets and on the top of such a wall.

FERN OR WILD GARDENS.

Another type of herbaceous garden is what may be called a wild or fern garden, not because ferns of necessity form a large proportion

of it, but because the plants that would be used are such as succeed under the same conditions as many of the ferns. This, in brief, is a soil fairly well drained, usually acid, retentive of moisture, and well filled with leaf mold. Partial shade is also important for many of these plants. These conditions approach closely those found in open woodlands on soils moderately retentive of moisture.

Such a garden can often be developed on the north side of a building (fig. 15) or wall, on the banks of a shaded ravine, or with care even in a town yard if there is shade and the soil is not impregnated with lime.

The perennials for such a garden are ferns and many of the wild flowers of the northeastern United States and the mountain regions of other sections of the country.



FIG. 15.—A wild garden on the north side of a house as it appeared in late spring, ferns and wild flowering plants adding beauty to the yard.

SEASONAL AND OTHER GARDENS.

Bog plants are mostly used for naturalizing or for naturalistic effects and are treated in much the same way as perennials that are naturalized, due consideration being given to the difference in the water requirements of the different types of plants.

Water or aquatic gardening is so different from the handling of other herbaceous perennials, the plants being grown in water, that its treatment does not come within the scope of this bulletin.

Seasonal gardens, such as June gardens, September gardens, and so on, are created by selecting those plants that are especially showy at the season when the greatest attractiveness is desired. Attempts

at special results of this character are mostly confined to gardens or borders, although they may be utilized with any type of planting.

Many herbaceous perennials are satisfactory for use as cut flowers. These should be planted in rows (fig. 16) as vegetables are grown, for under those conditions the necessary culture can be more easily given.

CULTURE.

The cultural treatment of herbaceous perennials depends on the type that is to be grown and the conditions under which they are most likely to succeed. Their treatment in gardens and borders will be considered together because the methods of handling are similar.

GARDENS AND BORDERS.

To be successful, a garden or border must be supplied with a good, thoroughly drained, well-enriched soil to a depth of 2 feet, so that plants will have ample feeding ground, as a bed so prepared will

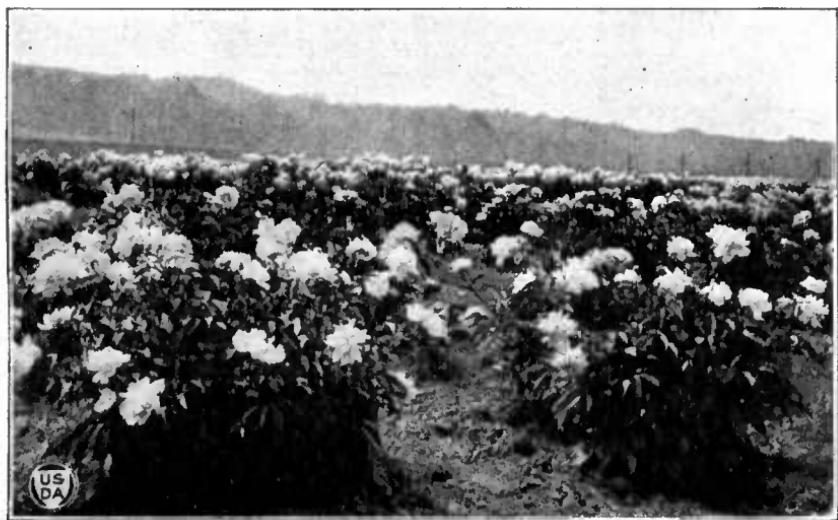


FIG. 16.—Peonies grown in rows for ease of cultivation to furnish flowers for cutting.

be likely to remain three or four years before replanting. In many places this will require special preparation by carefully saving all existing topsoil, removing the subsoil until the proper depth is reached, supplying topsoil to replace the subsoil removed, and incorporating an abundance of well-rotted manure and other fertilizers with the soil before replacement in the bed. Ground bone, cottonseed meal, tankage, and similar materials are useful with the manure. For some plants, wood ashes or lime and potash are also helpful, but for others the lime, alone or as contained in the wood ashes, is deleterious.

If the soil is not naturally well drained it will be necessary to provide artificial drainage. This may be done by putting drain tiles under the bed and connecting them with a suitable outlet, or by using a layer of stones in the bottom (fig. 17) and providing an outlet on lower ground or by connecting it with a sewer.

The time to transplant depends upon the season of flowering and local conditions in respect to temperature, moisture, soil, and prevalence of high winds. Where winters are severe, especially on soils that are liable to heave the plants, spring planting is better than fall planting; but where the winters are moderate, particularly on lighter soils that do not heave badly, fall planting is preferable. Fall-blooming plants that are propagated by division should be moved in the spring unless the winters are almost frostless.

The accompanying map (fig. 18) indicates in a general way where fall transplanting would probably be most successful, as well as those regions where it would not be likely to succeed. Fall planting should be done at least a month or six weeks before freezing weather, but better two or three months before, so that the plants may become established before winter. In dry countries, especially where there are severe drying winds, the newly planted bed needs to be thoroughly soaked soon

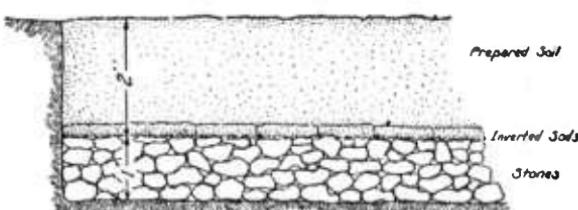


FIG. 17.—Cross section of a specially prepared bed suitable for herbaceous perennials.

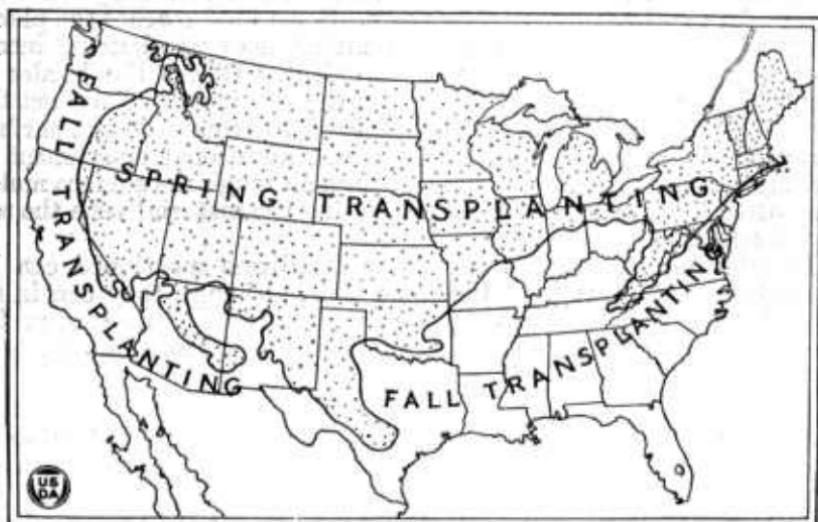


FIG. 18.—Map of the United States, showing by stippling those portions of the country where transplanting should be attempted only in the spring. In the unstippled areas, marked "fall-transplanting," the spring and early-summer flowering plants may be moved either in early fall or spring, while fall-flowering plants should be moved in the spring.

after planting and then mulched to retain as much of the moisture as possible through the winter.

In cold regions hardy perennials do better with a winter mulch, particularly where the frost penetrates to a depth greater than that to which the roots extend. It is best to apply this mulch just after the ground freezes, because at this time it is less likely to be a harbor for mice and the frost in the ground will help to maintain uniform

conditions during the winter. Where a continuous winter covering of snow is usual a slight covering of litter to hold the early snows is all that is necessary, but it should be applied just after the ground freezes. Winter mulch must not be applied too thickly to plants having fleshy leaves that stay green all winter, for these will heat and rot if deeply covered.

It is usually best to leave the cleaning up of the tops from the herbaceous border until the approach of spring, as the fallen tops make one of the best winter protections to the plants themselves, and they also help to hold in better position any other mulch that may be added, preventing it from packing closely with plants whose tops die each year. It is contrary to the idea of neatness in the garden, but if the good of the plants rather than the temporary gratification of the gardener is what is desired, the tops are better left for the winter.

For success with perennials care must be frequent and timely, for weeds must not be permitted to grow among them. Because of the more permanent character of the plantation, weeds seem to be more persistent and more difficult to eradicate than with annuals where the ground can be thoroughly spaded each year.

Most perennials spread and multiply so rapidly that it is desirable to divide them about once in three or four years. At the time of this resetting a new supply of manure should be worked into the soil. This should be sufficiently liberal to keep the soil supplied with humus for another three or four years. Some food reaches the plants from each winter's mulch, but the mulch does not become incorporated with the soil to any great extent. Where the border is spaded between the plants each season the few inches on top get the benefit, but where the mulch is permitted to remain on the surface throughout the summer even this slight additional enrichment is lacking except what comes from leaching, although the surface mulch may often be as beneficial as incorporating the material with the top layers of soil.

In addition to manure, the other fertilizers mentioned can be spaded in to advantage at the same time, although they can in no sense be regarded as substitutes for an abundance of manure or for the application of reasonable quantities of it as a winter mulch.

BEDS AMONG SHRUBBERY.

Shrubbery beds are usually not so well prepared for planting as gardens and herbaceous borders, and therefore only the more robust plants are likely to do well without some additional preparation; but this is not usually done unless these beds are to be used as a substitute for an herbaceous border. The later culture is principally the pulling of weeds that may show a tendency to compete with the perennials. As a rule, little hoeing is done in such situations, although mulching to keep down weeds and conserve moisture may be used. Openings between the shrubs sufficiently large to warrant the planting of perennials are too large to have weed growth checked by the shade of the shrubs. Special attention along these lines is therefore necessary.

Division and replanting of perennials among shrubbery is necessary about as often as in the border or garden. Mulching is also

helpful and beneficial to the shrubbery as well. A summer mulch is probably more practical than continued cultivation as a means to conserve moisture and discourage weed growth with a minimum of attention.

NATURALIZED PLANTINGS.

Naturalizing of perennials is done by planting them as nearly as possible in a way comparable with that in which they would be likely to grow wild, or by sowing the seed in favorable locations with little further attention. To succeed the plants used must be adapted to the soil as well as to the conditions with respect to shade and competing vegetation. If adapted to the conditions, they will maintain themselves with little attention and appear as though they grew naturally in the location.

ROCK GARDENS.

In a rock garden little or nothing can be done in the way of fertilization of the soil after it is constructed except in an occasional pocket. Fortunately, the plants that thrive best in a rock garden need little special manuring for their successful growth. In fact, they flourish best on rather poor, well-drained soil. It is necessary that this sort of a garden be watched as carefully as a border, in order that weeds may not become established and encroach upon the desirable plants. Rock gardens are usually best adapted to plants requiring dry or well-drained situations, though occasionally they provide moist, almost wet conditions, in which case the plants must be especially selected for the place. The dry gravelly soil discourages the growth of many plants that might become troublesome weeds on better soil.

Little can be done in the way of mulching as practiced in borders, but even where possible it would not be desirable, as most of the plants adapted to rock-garden culture either do not require mulching, or winter best with a mulch of gravel about them to prevent winter rot at the crown.

Rock gardens do not require tearing out every few years to have the soil renewed, and the plants as a rule do not need thinning to keep them from becoming overcrowded.

WALL GARDENS.

The culture of the wall garden is primarily the elimination of undesirable plants. Plants in a wall garden should not be too large. If the soil used in filling the pockets is not too rich, growth will be checked. Mulching of course is impossible in such a situation, so that only those plants can survive that will grow in well-drained soil without protection.

WILD GARDENS.

In a wild garden the conditions must be maintained as nearly like the natural conditions in a woodland as possible. This means no hoeing or stirring of the soil and as little disturbance of it in any way as possible. Weeds must be kept in check by pulling, and the

gardener's tendency to remove fallen leaves and dying stems must be curbed, as everything of this kind should remain upon the ground; and often, in addition, leaves of hardwood trees should be spread over the garden in the fall and be permitted to remain there to rot. Evergreen plants like some of the ferns should have little or no mulch, but where the tops die off in the fall a mulch of leaves from hardwood trees can be used to advantage to help produce leaf mold. Lime should not be applied to these plants, although some of them succeed on limestone soil when overlaid with a moderate thickness of leaf mold.

PROPAGATION.

It is usually best for the beginner to purchase plants of hardy perennials from some of the many nurseries making a specialty of



FIG. 19.—Dividing a herbaceous perennial to provide more plants.

them. After some experience in growing them the gardener may then do his own propagating with confidence of success.

PROPAGATING BY DIVISION.

A common way of propagating these plants is by division of the roots or crowns. When the plant is dug and the roots are freed from earth it will be seen that it may be cut into a number of pieces, each having some leaves, stems, or buds with some roots. (Fig. 19.) Each piece of this character may be separated and planted with

reasonable prospect of becoming a plant. This should be done in the spring, or in those regions where fall transplanting is successful at least three months before severe freezing weather. Where the winters are too unfavorable for successful fall transplanting, propagation should be attempted only in the spring unless there are available coldframes³ such as are used for wintering vegetable plants and protecting tender plants in the spring. In the case of bulbous plants, the vegetative propagation⁴ is by the division of the old bulbs or by using the bulblets which grow along the stem near the old bulb. Some of the hardy perennials are more satisfactorily grown from cuttings of the stem rooted in sand than from divisions of the root.



FIG. 20.—A lath screen used to produce partial shade for the growing of seedlings and young shade-loving plants.

PROPAGATING BY SEEDS.

Many of these plants are successfully grown from seeds. This method is principally used for those species which vary little from the wild type and so reproduce themselves with little variation. The gardener needs to keep clearly in mind that seeds will reproduce the same species of plant, but where a species has varieties, those varieties will usually not be reproduced from seed. Seeds from a named variety of peony, iris, or perennial phlox will produce peonies, irises, and phloxes, but rarely will one of the seedlings closely resemble the parent, and they may differ widely from it. This tendency to varia-

³ For a description of coldframes, their construction and management, see Farmers' Bulletin 1171, *Growing Annual Flowering Plants*, and Farmers' Bulletin 460, *Frames as a Factor in Truck Growing*.

⁴ Vegetative propagation is the propagation of plants by division, cuttings, grafting, or any other method except by seeds. For additional information, consult Farmers' Bulletin 157, *The Propagation of Plants*.

tion is what makes the production of new varieties possible. The element of chance that enters when the more variable species are grown is a great incentive to cultivating plants from seed, but one who grows new things in this way must be extremely careful not to become overenthusiastic and name and try to introduce new varieties, unless the combination of characteristics is really better than anything in existence, as judged by those with wide experience in growing that species. As a hobby for the benefit of one's own garden it is always worth while, particularly if varieties that are not as good as existing ones are systematically and persistently destroyed.

Most of these seeds may be sown either in spring or soon after mid-summer for bloom the following year. Early spring sowing will



FIG. 21.—Bearded iris.

produce larger plants, but with most kinds there is no special advantage in this. The seed of a few perennials must be sown as soon as ripe or it will fail to germinate, for example, phlox. A few perennials bloom best the first year after sowing, and others called biennials bloom only the one year. It is best to sow seed of these every year to have young plants available each season. Examples of these plants are the foxglove, sweet-william, and hollyhock. Seed may be sown as soon as ripe for the next year's bloom, but it requires two growing seasons for them to produce flowers, although they complete their growth and produce seed within a year. Pansies, too, may be handled in this way where the winters are not too severe, although they are classed as annuals because they bloom freely the first season from seed. A number of the perennials also will bloom

the first year from seed, but to accomplish it most of them need special care, including planting the seed early in the spring under glass.

Many of these plants that are readily grown from seed succeed best in a rather rich garden soil that is not too heavy. This soil should be well drained, but on the other hand retentive of moisture, so that it will not tend to dry out too much while the seeds are germinating. It should also be sufficiently light and friable, so that the surface will not bake and thus prevent the growth of the seedlings. If protected from winds, evaporation will be less rapid, and it will be easier to prevent the soil from becoming too dry. A partially shaded situation is often an advantage, but the shade must be neither too dense nor continuous throughout the day. Such shade is sometimes produced artificially by a lath screen. (Fig. 20.)

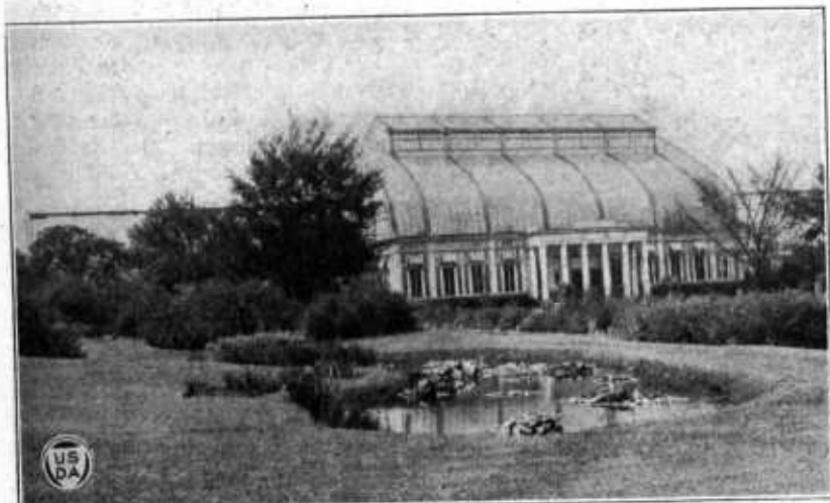


FIG. 22.—Yellow water iris on the outside edge in the foreground and our wild native species (*Iris versicolor*) in the bay in the background.

The seed bed should be well supplied with humus. If there is any doubt as to the condition of the soil in this respect well-rotted manure should be applied. Fresh manure should not be used, and the rotted manure should be spaded in so well that the number of seeds coming in contact with it shall be as few as possible. When the soil has been thoroughly spaded and raked fine, the seeds may be planted. Usually it is best to plant in rows, as then the seedlings may be more easily distinguished from the weeds, which will facilitate keeping the bed clean. Most seeds should be covered with soil not to exceed in depth four times their diameter, firmed gently about them. If the soil is inclined to be dry, a good watering will serve to compact it about the seed and at the same time to provide the needed moisture. To maintain uniform moisture conditions with summer-planted seed it is sometimes a help to lay boards upon them for a few days, but these must be removed before the seeds begin to grow. Sand as a covering for seed is less likely to bake than soil.

When the seedlings have their first true leaves they must be transplanted or thinned, and for best results they must at all times have plenty of space. Frequent transplanting of most kinds is beneficial.

Young plants can be transplanted to their permanent location the first fall in those sections where fall transplanting is advisable, but a few kinds inclined to have heavy taproots are best left until spring, as they often heave badly and either are killed during the winter or have to be reset in the spring with the crowns a little below the surface of the ground. Some examples of such plants are the aquilegia, delphinium, platycodon, and hollyhock.



FIG. 23.—A clump of Siberian iris.

KINDS TO USE.

Like any other ornamental plant, a herbaceous perennial to be satisfactory must be healthy and at least reasonably vigorous under the conditions where it is grown or it can not be attractive in flower or foliage. If it does not conform to these requirements in any locality it should be discarded for plants that do. Because of the wide range of variation in temperature and precipitation, as well as character of soil, few plants will succeed in all parts of the United States. In order to explain more readily where they will succeed, a map has been prepared (see fig. 71) dividing the country into regions which are described in detail beginning at page 74.

After the requirements of soil, climate, and conditions of culture are met, the season of bloom, the height of the plant, and the color

of its flowers or the effect of its foliage are what determine those selected for planting. In reading the descriptions of these characters for the various plants, it must be remembered that the season of bloom for any plant varies with the latitude and the elevation, so that this can only be expressed in the broadest terms; for example, flowers that bloom in May in the far North will bloom in March or even in February in the South. To a limited extent, the same is true with respect to the heights to which they grow, as this varies with the climate, the exposure, and the fertility of soil.

To give a clearer idea of perennials adapted to many sections of the country, several kinds will be considered in detail, and from among these a selection for planting may safely be made by either the novice or the experienced grower.



FIG. 24.—Japanese iris.

IRIS.

Irises, flags, or fleurs-de-lis are common old-fashioned garden flowers adapted to nearly all parts of the United States. Many of the commoner species succeed through a wide range of territory, and there are a large number of species with very different requirements for growth. Some of these like moist places, others dry; some like heat, others thrive in cold; but most of them stand rather protracted droughts, better in fact than most plants. They range in height from very dwarf, or those not over 7 inches tall, to those with leaves 4 feet and blossom stems $4\frac{1}{2}$ and even 5 feet high.

The foliage is long, narrow, frequently rather thick, and in general like much-enlarged grass blades. The flowers are often spoken of as "orchidlike" because of the unusual arrangement of the petals and colored sepals giving the blossoms a striking appearance. The season of bloom is usually in spring and early summer, while the colors are mainly purples and white, with some yellow species.

They are adapted to a wide range of soils, most of them doing best in full sun. Except a few bulbous varieties, they are propagated by division of the fleshy roots called rhizomes.

They multiply quite rapidly, and at least every three or four years the plants of most kinds should be divided and reset. Nearly all species do best on a rich soil, although they will thrive on much poorer ground.

At the present time the growing of iris is on the increase. For his own amusement the enthusiastic gardener might plant seed from some of his iris plants as soon as it is ripe, keeping the bed well mulched or cleanly cultivated. Much of this seed will come up during the next two years. As the seedlings appear they should be transplanted to their permanent location, and most of them will



FIG. 25.—Peonies used with shrubbery in home-ground adornment.

flower the following spring. If they are not transplanted as soon as they come up their growth will be checked and it will take a year longer for them to bloom.

The bearded irises (fig. 21) include the plants that were known in the gardens of our grandmothers as flags, blue flags, or fleurs-de-lis. These include German iris (*Iris germanica* L.), *I.⁵ neglecta* Hornem., sweet iris (*I. pallida* Lam.), *I. plicata* Lam., *I. sambucina* L., *I. squalens*, purple-vein iris (*I. variegata*), stool iris (*I. aphylla* L.), Florentine iris (*I. florentina* L.), lemon iris (*I. flavescens* DC.), and others. They are native throughout central Europe and are well adapted for culture throughout the United States except in the subtropical regions, such as Nos. 10, 31, and 32, and where the available moisture is very slight, as in regions 9, 10, and 11. Many of these plants are sold on the market to-day as German iris and

⁵ For the sake of brevity, the name of the genus in botanical names, after being once stated in a given connection, is often abbreviated by using only the initial letter. Thus, *I. neglecta*=*Iris neglecta*.

include not only several species but also their hybrids with one another. Their foliage grows to a height of 2 to 3 feet and has more or less of a glaucous sheen. It is persistent through the winter with most varieties. The flower stalks grow a foot or more above the leaves and usually bear from 2 to 6 or 8 flowers, of which but two open simultaneously. With some of the newer varieties there is a great increase both in the total number of flowers and in the number open at one time. There are from several to many stalks in a well-established clump. The individual flowers usually do not last more than two days and are about 3 inches across in the common varieties, but some of the newer kinds have flowers 6 inches or more in width. They bloom just as the oaks are coming into full leaf. The principal varieties are blue and yellow, with some admixture of browns and purples and also white. The varieties are mostly hybrids and are usually classed with the species they seem most to resemble. They thrive in any good garden soil east of the one-hundredth meridian and farther west if provided with a reasonable amount of water in spring and early summer and if not allowed to become too dry in late summer. They seem to do well even in the presence of a moderate amount of alkali. Fresh manure used about them as a mulch, especially on heavy soils, seems to encourage a disease that is spoken of as "rot."

The common yellow iris, or yellow water iris (*Iris pseudacorus* L.), grows 2 to 3 feet high with flat, rather broad foliage of a little deeper green than the bearded iris, with pure yellow handsome flowers opening in the late spring. They can be grown where water stands about their roots, as on the edges of ponds (fig. 22), and with the exception of our wild native iris (*I. versicolor* L.) it is the only common variety that will succeed under such conditions. It is also successful in good garden soil away from standing water.

The Siberian iris (*I. siberica* L., fig. 23) has foliage slightly above 3 feet tall, narrow and dark green, growing in upright, compact clumps. It will thrive near water, but its roots must be above the water level. The flowers are small, the largest being only about 2 inches in diameter, deep blue and white with intermediate colors, opening just after the bearded iris, in fact, before the later varieties of this are gone. It is an attractive plant with its profusion of dainty flowers.

There are several species of dwarf iris that will thrive in almost all parts of the country. Some of these are the iris nudicaulis of gardens and catalogues (botanically, *I. aphylla* L.), the crested iris (*I. cristata* Ait.), the French dwarf iris (*I. chamaeiris*, often erroneously called *I. pumila* Bertol.), and others. They grow 4 to 8 inches high and spread quite rapidly in soils that are not too heavy. They bloom early in the season, usually within a month of the last freezing weather. The colors are mostly blue, violet, and white.

The Japanese iris (fig. 24) is one of the tallest as well as the latest blooming of the iris varieties in general cultivation. It is usually spoken of as *Iris kaempferi*, sometimes erroneously called *I. laevigata*, although some of the latter may be in cultivation in the United States. It reaches a height of 5 feet or more, and the foliage in rich moist soil attains nearly 4 feet. It likes a rich soil and does not seem to be injured by liberal applications of manure.

A good way to apply manure is to use it as a winter mulch and then work it under in the spring. This species likes plenty of moisture and is therefore especially adapted to use along stream banks or at the edges of pools, provided its roots are sufficiently above the water level so that there is no danger of the rhizomes standing in water. As with other water-loving species, lime is injurious. Many of the flowers are 5 inches or more in width, borne several on a stem, and



FIG. 26.—Feverfew.

with many stems to a clump. Usually, however, not more than one or two blooms to a stalk open at the same time.

The Spanish iris (*I. xiphium* L.), listed by dealers as *iris hispanica*, is one of the bulbous irises adapted only to the mild-winter sections of the country, such as regions 20, 28, 29, and 30; portions of the dry-farming area where the temperature does not get too low, as in regions 11, 16, and 17 on the Pacific slope; regions 1, 2, 3, 5, 10, and the lower levels of 4; and is especially adapted to those

places subject to severe drought through the summer. It is hardy as far north as New Jersey in protected situations. It grows to the height of a foot, with flower stems 18 inches or more tall. They should be planted by October with 3 inches of soil over them and may be as close as 4 inches or less, but more space is better, as they multiply very rapidly. The foliage dies to the ground each year soon after blooming, but makes a little growth in the fall.

The English iris (*I. xiphioides* Elw.) is another bulbous iris that grows under temperature conditions similar to those described for the Spanish iris, but it needs more summer moisture. In the Eastern States the English iris does better than the Spanish iris, but in California the reverse is true unless the English iris can be given moisture and partial shade. It is about the same height as the Spanish iris, but the flowers are larger.

There are hybrids of several rhizomatous iris species native to Asia Minor and adjacent regions that can be grown outdoors in California, Oregon, and Washington outside of the Puget Sound region, and these may be classed as hybrid Palestine irises. They are not easy of culture, but are handsome and well worth special effort. They are now practically not on the market, but it is possible that they will be in the future. They do best in a well-limed soil and need to be kept dry through the summer.

In California there are a number of native iris varieties suitable for garden culture. As these can not be successfully transplanted at or near blooming time, they should be moved when growth begins in the fall, or they may be grown from seed. In New Mexico and Arizona *I. missouriensis* is native and *I. florentina* and *I. albicans* have become naturalized.

PEONY.

The peony (*Paeonia officinalis*), or "piny" of old-fashioned gardens, next to the iris, is the most generally grown perennial about the home and in gardens in the northeastern United States (fig. 25). It grows to a height of 2 or 3 feet, forming large clumps of handsome dark foliage that is comparatively free from insect and disease attack. In late spring the plants are covered by their large handsome white, pink, rose-colored, or crimson, double or single flowers; there are also some cream-colored kinds. By a proper selection of varieties it is possible to have these plants in bloom for a month. They prefer a rich, loamy, well-drained but well-watered soil in full sun, although they succeed in partial shade. They must have plenty of water at blossoming time in order to do their best, but on the other hand the blossoms are spoiled by rain after the buds break, and hot weather at that time makes them open rapidly and fade as quickly. Because of this effect of heat upon them their culture south of the thirty-eighth or thirty-ninth parallel has been limited, although they may be found reasonably satisfactory over a wider range of country. They are especially well adapted to the northern Great plains and other regions with cold winters, being very hardy, but not suited to regions 5, 10, 11, 17, 30, 31, 32, and the warmer parts of regions 16, 20, and 29.

They do not need transplanting as frequently as most perennials; in fact, it takes three years for a plant to become well established.

The plants may then remain without transplanting for 5 or 10 years and sometimes even longer. A careful gardener will note when the plant shows indications of overcroding and needs dividing and resetting. Propagation is effected by dividing the fleshy roots, which may be separated and cut in pieces if a good bud of the crown is left with each piece of root. This is probably best done in late summer or early fall, so that the plants may become well established before winter. New varieties are obtained by sowing seed. This should be done as soon as it is ripe, and the bed where the seeds are planted must be kept free from weeds. Roots will form the first season, but the top will not appear until the second season. About the second or third year after this the plants will begin to bloom. A new seedling is seldom found that is better than existing varieties. One of the fascinations of the experience, however, is that every grower of seedlings, feeling that he has a prize among his varieties, names and puts upon the market varieties that are no better and usually inferior to those already in the trade. This practice should be avoided by every conscientious grower.

Unlike many hardy perennials, the top of the peony dies to the ground every year. Toward spring the old leafstalks should be cut off 3 inches above the ground.

In transplanting the roots, they should not be set too deep nor have more than 2 inches of soil over the crown. They should be given clean culture, and they respond to liberal applications of either fresh or rotted manure, which should be dug in about the roots in early spring as soon as the ground is fit to work.

Peonies are subject to a serious root rot regarded as contagious and to a disease that prevents the buds from opening. Sometimes the blossoms persistently fail to open. The cause or causes of the difficulty have not been satisfactorily determined. Planting too deep is supposed to be one reason for such behavior; another, a disposition of some varieties to form buds that produce nonflowering plants; a third is too close propagation—that is, the roots are too frequently dug and cut into small pieces to obtain a large stock of plants quickly. Whether or not any of these explanations is the valid one, the practical thing to do, if a peony is not set too deep and fails to bloom for four or five years, is to put another variety in its place.

The size and quality of individual blossoms may be improved by removing all the buds from a stem but the best, removing also a number of the flower stems from the plant in the early stages of development. Feeding the plant with liquid manure after the buds have set also stimulates growth.

When peonies are to be cut for the flowers, the best time is just as the sepals or green coverings separate enough to show the color within, which will be when the bud is about the size of a large hickory nut. By cutting at this stage and putting in a cool place the rapidity of opening will be retarded, and the substance and keeping quality of the blossom will be increased. Such buds if kept in cold storage at a low temperature can be held three weeks or more. Many peonies are grown for florists' use.

The list of varieties from which to choose is large, ranging from the old-fashioned *officinalis rubra*, a double brilliant deep crimson, through all shades of rose and pink, to white and cream, and through all degrees of doubleness from full double balls to

flat singles with a single row of petals. In selecting varieties for any locality it is well for the beginner to limit the selection to the cheaper old standard varieties recommended by the nearest reliable grower, because a variety so recommended undoubtedly has merit in itself or it would have been dropped from the lists, and its cheapness indicates that it is a good grower. High-priced vari-



FIG. 27.—Types of hardy chrysanthemums.

ties are either poor growers or new varieties. A beginner does not want a poor grower and can afford to wait for more knowledge of the plants before investing in those that will soon either be discarded or become cheaper. He should by all means start with named varieties of the best standard sorts obtainable, and after gaining a little knowledge of the flower and its requirements he may then venture along lines that are most appealing. Prices for new peonies are probably higher than for any other new plants except orchids,

yet the prices of satisfactory standard varieties are reasonable and within the reach of all.

As determined by a symposium of the American Peony Society, 22 leading varieties are Le Cygne, Kelway's Glorious, Therese,



FIG. 28.—Columbine.

Solange, Mine. Jules Dessert, Tourangelle, Festiva Maxima, Walter Faxon, E. B. Browning, La Fee, M. Jules Elie, Philippe Rivoire, Frances Willard, Lady A. Duff, Martha Bulloch, Baroness Schroeder, La France, Longfellow, Milton Hill, Raoul Dessert, Rosa Bonheur, and Sarah Bernhardt.

CHRYSANTHEMUM.

Chrysanthemums are of several distinct types. They are adapted to all parts of the country except the subtropical and arid regions, but require water in the semiarid sections, although they stand drought well.

They thrive in any good garden soil, but give best results in a deep, well-enriched one and respond to extra care. They are well adapted to borders and for cutting.

Pyrethrum, the painted daisy, sometimes called feverfew (*Chrysanthemum coccineum* Willd., also frequently listed as *Pyrethrum roseum* Bieb.), is adapted to all parts of the country except the Rocky Mountain region and adjoining dry plateaus, together with southern Florida. It grows to a height of 1 to 2 feet, with finely cut foliage of half that height that is attractive through the season. In early summer it has single red, pink, or white daisylike flowers $1\frac{1}{2}$ to 2 inches across, with bright yellow centers; there are also double and anemone-flowered forms. They are propagated from seed and thrive in sun or half shade, but must have a well-drained soil to prevent the fleshy crowns from rotting during winter.

The giant daisy (*C. uliginosum* (Waldst. and Kit.) Pers.) is a large white daisylike flower 2 to 3 inches across that blooms in late fall, growing to a height of 3 to 5 feet if given ample moisture. Preferring a moist soil, it is not adapted to the semiarid regions except under irrigation; it is good for borders and cutting, but as it spreads by underground stems it must be watched to prevent its crowding less vigorous plants.



FIG. 29.—The peach-leaf bellflower, or peach bell.

prevent the fleshy crowns from rotting during

The Shasta daisy is a form of *C. maximum* adapted to all parts of the country except regions 10, 11, 29, 30, 31, and 32, needing water in region 9 and other excessively dry places. It grows to a height of 2 to 3 feet, much branched, with yellow-centered white flowers in summer and fall. It is good in sun and heat if watered moderately, useful for borders and for cutting, and usually propagated by division. There are several other varieties of the species to which the Shasta daisy belongs, among which is the variety Alaska.

The feverfew (*C. parthenium* (L.) Bernh., fig. 26) is another widely cultivated hardy perennial adapted to all parts of the country. It is of easiest culture and usually propagated from seeds. A yellow-foliaged variety is known as golden feather.

The hardy chrysanthemums (*C. indicum* L., *C. morifolium* Ramatuelle, and especially hybrids known as *C. hortorum*) are among the most satisfactory hardy perennials from Philadelphia southward and westward to eastern Kansas and eastern Texas. They are also successful in Oregon, Washington, and California where water can be supplied. A few varieties succeed in Massachusetts and New York.

They grow from 2 to 4 feet high, with corresponding variation in their compactness. Some of them have stiff stems; others are inclined to be weak, requiring support to keep the flowers off the ground. Some retain good foliage at the base of the stems until the end of the season, while on others much of the bottom foliage dies before blossoming time, although this tendency can be controlled somewhat by good cultural methods. For ornamental plantings only those varieties should be kept that have self-supporting stems and hold an abundance of good foliage near the base until the end of the season. If grown for the flowers for indoor decoration or in a garden where quality of blossoms is more desired, varieties that require staking may be warranted, particularly if strong-stemmed varieties of the same quality of blossoms are not available. The larger flowered varieties are especially liable to have stems not sufficiently strong to keep the blossoms upright.

The color range is from purplish red, rose, and pink, through white to yellow, bronze, brick red, and maroon. In size they vary from half an inch to 4 inches and in doubleness from tight buttons and larger fully double flowers to a single row of petals with a large center full of bright-yellow florets and to almost single or aster flowered, including anemone-flowered and other intermediate forms. The largest of these may have a diameter of 5 inches, a few being shown in Figure 27. Some varieties of these types are used by florists, but are liable to be less hardy than those developed entirely for outdoor culture. Florists also grow tender chrysanthemums known as florists' chrysanthemums (*C. hortorum* of gardens), which become very large, even 10 inches in diameter when given special attention.

The foliage of hardy chrysanthemums is not large and inclines toward sage green. The blossoming season is in late fall near the time of frosts. At Washington, D. C., a large proportion of the varieties are so late in opening that about one year in three the flowers of many of them are spoiled by freezing. This is especially true of the white and pink varieties, as they seem to be most easily discolored

by cold. A few varieties have been grown with satisfaction in old gardens as far north as central New York. By breeding and selection it may be possible to develop new varieties that flower earlier, thus giving more general satisfaction in northern regions.

When the largest possible blossoms are desired, much can be done to increase the size of the flowers by disbudding. This consists in removing a large proportion of the buds as they form. Each branch forms a group of flower buds at the end, and in addition a large number of other buds form on side shoots just below the terminal flower. By removing a large proportion of these lateral buds and also whole branches and feeding the plant well with plenty of manure supplemented late in the season by applications of manure water, much larger flowers can be obtained than would otherwise be produced. The large flowers seen at exhibitions and in the windows of florists in the fall are produced by even more severely disbudding varieties of the florists' chrysanthemums. In fact, the usual method of handling these varieties is to keep all side shoots pinched off, permitting only one blossom to form at the end of this one stem. Sometimes more than one stem is allowed to grow from a plant, but even then but one flower to a stem is permitted to form.

Chrysanthemums seem to do well on all soils that are suitable for garden crops. They respond to heavy fertilization and can utilize coarse as well as rotted manure. Applications of manure water or a solution of nitrate of soda after the buds are formed will increase the size of the flowers.

They do best in full sun, although they seem not to be injured by some shade. They are easily propagated by division of the root or from cuttings rooted in sand. Commercially, it is usual to lift plants from the field in the fall and place them in a greenhouse,

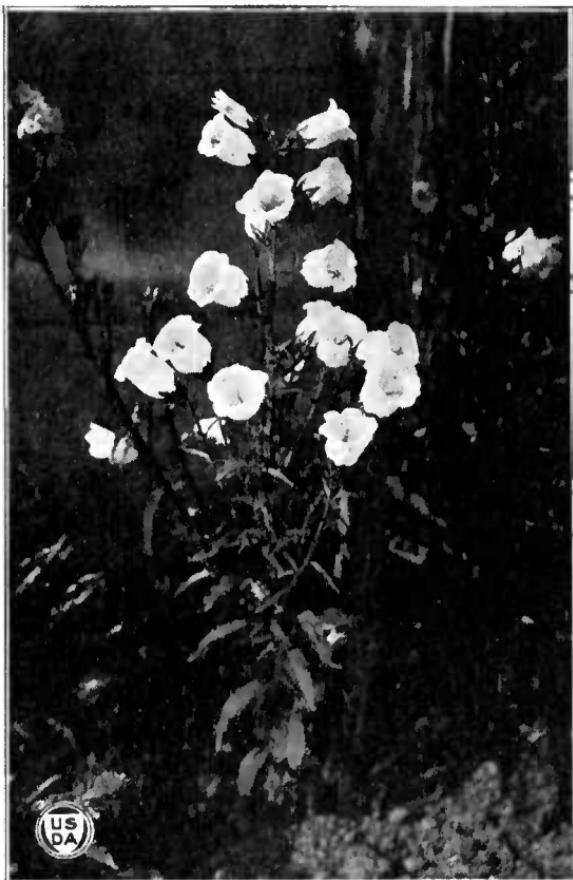


FIG. 30.—Single Canterbury bell, *Campanula medium*.

where growth starts, and then make cuttings from the young shoots when they reach a length of 6 inches. Plants that are permitted to winter in the open ground will in the spring send out new growth in the same way. Cuttings may be taken from these, or the shoots may be broken off with a few roots at the bottom, or the old clump may be broken or cut into pieces with several stems and roots. Probably the latter is the most satisfactory where clumps are desired for garden decoration. Such division should be repeated every year if the best results are to be obtained.

On heavy soils in the colder regions there is danger of some plants being killed, but a mulch of coarse manure or of straw will help in preventing injury if applied just after the ground freezes in early winter in the same way that strawberries would be treated.

Chrysanthemums stand transplanting well. It does not seem to interfere with the blooming of the plants to dig them early in the fall after the buds begin to form and plant them in large pots, tubs, or boxes for use indoors later after they come into bloom. In doing this, it is desirable to take as large a ball of earth as practicable, so as to disturb the contact of the roots and soil as little as possible. If done as the flowers begin to open, the wilting that almost inevitably accompanies such transplanting may injure the buds, and the flowers may not be as full and perfect as they would have been had the transplanting been done earlier.

COLUMBINE.

The columbines, or aquilegias (fig. 28), are a group of plants widely distributed throughout the United States, being found wild in practically all the States of the Union. Their native habitats are usually on rocky or gravelly soil, although easily cultivated on all well-drained soils. They are, however, particularly adapted to rock gardens and for naturalizing on rocky ledges. They will not thrive so well on the lighter lands in the warmer States and are not adapted to those regions that approach the subtropical, although they thrive in southern California (region 5).

They grow from 15 inches to 3 feet or more high, depending upon the variety. Their colors range from red and yellow in the American or wild columbine (*Aquilegia canadensis* L.) of the Eastern States, to pure yellow in the golden spurred columbine (*A. chrysanthia* A. Gray) and a bright blue in the Colorado columbine (*A. caerulea* James). There are cultivated forms that are larger and handsomer than the native species, although the latter are well worth cultivating. In addition there are many named varieties of the common European columbine (*A. vulgaris* L.), in shades of white and purple. These, like the American columbine, have short spurs, while the golden spurred and the Colorado columbine have long spurs.

Their foliage is raised well from the ground and attractive. The columbines, including many good native species not mentioned here, bloom in summer, preferring partial shade, as under the branches of shrubs, or full sun in moist situations. They are excellent for cutting. They may be propagated from seed sown either soon after ripening in summer or early the next spring, or by division of the clumps. They germinate very irregularly and slowly, requiring at least six weeks before the first seedlings appear. Having rather fleshy roots, they are best transplanted in spring or early enough in

the fall to become well established before winter. Clumps in the garden will last longer if the seeds are not allowed to mature each year.

CAMPANULA OR BELLFLOWER.

The genus *Campanula* includes biennials and perennials, the different species varying in height from 8 inches to 5 feet. They are profuse bloomers, the colors being largely rich blues and white, the different varieties carrying the season of bloom from late spring to early fall. They are adapted to the whole country except regions 9, 10, 11, 17, 30, 31, and 32, and in region 9 can be grown with irrigation.

The foliage is dark green, much of it of basal leaves. Propagation is from seed sown either in spring or summer or by the division of clumps. They like a rich, well-drained soil, doing best in partial shade, and their culture is easy. The winter mulch should be light, either some brush or a light covering of coarse straw, except in regions 7, 8, 9, 12, 13, 14, 15, 18, 21, 22, 23, 24, 26, and 27, where a layer of leaves of hardwood trees 2 to 3 inches thick should be used. They are all useful border and rockery plants.

The Carpathian bluebell, or Carpathian harebell (*Campanula carpatica* Jacq.), is a perennial that grows in compact tufts 8 to 15 inches high and bears clear-blue flowers held erect on wiry stems. It begins blooming in late spring and continues until early fall or later. There is also a white form (*C. carpatica alba* Hort.).

The bluebell, or harebell (*C. rotundifolia* L.), is a perennial that grows 6 to 12 inches high, bearing blue flowers in early summer. In shade it will grow taller, and it likes an abundance of moisture with good drainage.

The clustered bellflower (*C. glomerata* L.) is a perennial that grows 1 to 2 feet high and bears its funnel-shaped violet-blue flowers in dense clusters through early summer. There are several named varieties.

The great bellflower (*C. latiloba* A. DC.) is a perennial that grows 12 to 18 inches high, bearing saucer-shaped violet-blue flowers in late spring.



FIG. 31.—Chinese bellflower, or *platycodon*.

The peach bell (*C. persicifolia* L.), or peach-leaf bellflower (fig. 29), is a perennial that attains a height of 2 to 3 feet, bearing blue flowers in early summer. It is considered one of the best for general culture. A white form is called white peach bell (*C. persicifolia alba* Hort.), and there are also double forms and several named varieties.

The single Canterbury bell, or Canterbury bellflower (*C. medium* L., fig. 30) is a biennial that attains a height of 3 or 4 feet and bears blue, rose, and white flowers in midsummer. If the seed should be sown very early in the spring, not later than mid-March indoors in the North, some blooms may be obtained the same season. The young plants should be transplanted, whether sown in early or late spring or in summer. They are classed with the easy plants for gardens in



FIG. 32.—Sweet-william.

California, as they do well in hot places if they have some afternoon shade. Like pansies, the young plants winter in a coldframe better than in the open in the northern half of the country. They may also be potted and used as a winter house plant, if they have not become spent in the garden, or they can be transplanted successfully in the open within four or five weeks of the time winter sets in.

The cup-and-saucer Canterbury bell, or cup-and-saucer bellflower (*C. medium calycanthema* Hort.), is a form of the Canterbury bells in which the calyx is enlarged and colored like the corolla, suggesting a cup and saucer, or, more nearly, a tall cup within a shorter broader one. It attains a height of 2 to 3 feet, bears blue, rose, or white flowers in midsummer, and is handled the same as the Canterbury bell.

The chimney bellflower (*C. pyramidalis* L.) is a perennial that attains a height of 4 or 5 feet or more, making a pyramidal plant

with blue salver-shaped flowers in midsummer. It may also be used as a winter pot plant. There is a white variety (*C. pyramidalis alba* Hort.) which is otherwise identical.

PLATYCODON.

The platycodon (fig. 31), Chinese bellflower, Japanese bellflower, or balloonflower (*Platycodon grandiflorum* (Jacq.) A. DC.) is adapted



FIG. 33.—The hardy garden pink at home in a rock garden.

to all parts of the United States except regions 5, 10, 17, 30, 31, and 32; but in the semiarid regions these plants require irrigation. They grow from 1 to 3 feet high, forming a dense branching bush with attractive dark-green foliage, producing blue or white flowers constantly through midsummer. They thrive on any good garden soil, in sun or shade, are useful in the border and propagated chiefly from seed. Transplanting is best done in spring or sufficiently early in the fall to permit of the fleshy roots becoming thoroughly estab-

lished before winter. There are some botanical as well as many horticultural varieties, some of them not over 1 foot high.

DIANTHUS.

In this group are many valuable garden plants, including sweet-williams, carnations, and pinks of many kinds. They are adapted to all parts of the country, but require protection in the colder regions where there is not a good snow cover in winter and require much water in semiarid regions 9, 10, 11, 16, and 17. They grow in good garden soil that is well drained in winter and do best in full sunshine.

The sweet-william (*Dianthus barbatus* L., fig. 32) is a biennial that gives best results from year-old plants, grows to a height of 12 to 18 inches from tufts of foliage 10 inches high in early summer, and has



FIG. 34.—Maiden pink in a rock garden.

showy heads of crimson, pink, and white flowers. The best way to handle them is to sow the seed as soon as ripe, and plants will be ready for bloom the following year. They are easily grown; in fact, in most cases they will reseed themselves freely. If the perpetuation of any particular color or combination is desired it must be done by dividing the plant or by propagating from cuttings. It is most useful in the border.

The grass pink, garden pink, hardy garden pink (fig. 33), Scotch pink, or pheasant-eye pink (*D. plumarius* L.), is an easily grown, satisfactory border plant 6 to 12 inches high, with spreading grass-like habit of growth, bluish foliage, and fringed petals on the fragrant rose-colored to white flowers borne in spring and early summer.

They must have full sun, soils not too rich, and are useful for rock-work, dry walls or banks, edgings to borders even of dry beds; also for cutting.

There are many named varieties among them. The perpetual pink, sometimes called the homestead pink (*D. plumarius semperflorens* Hort.), is a form that blooms more continuously than the grass pink.

The clove pink, or picotee (*D. caryophyllus* L.), approaches rather closely to the original form of the species from which the carnation is derived. These garden forms are very useful in the border or

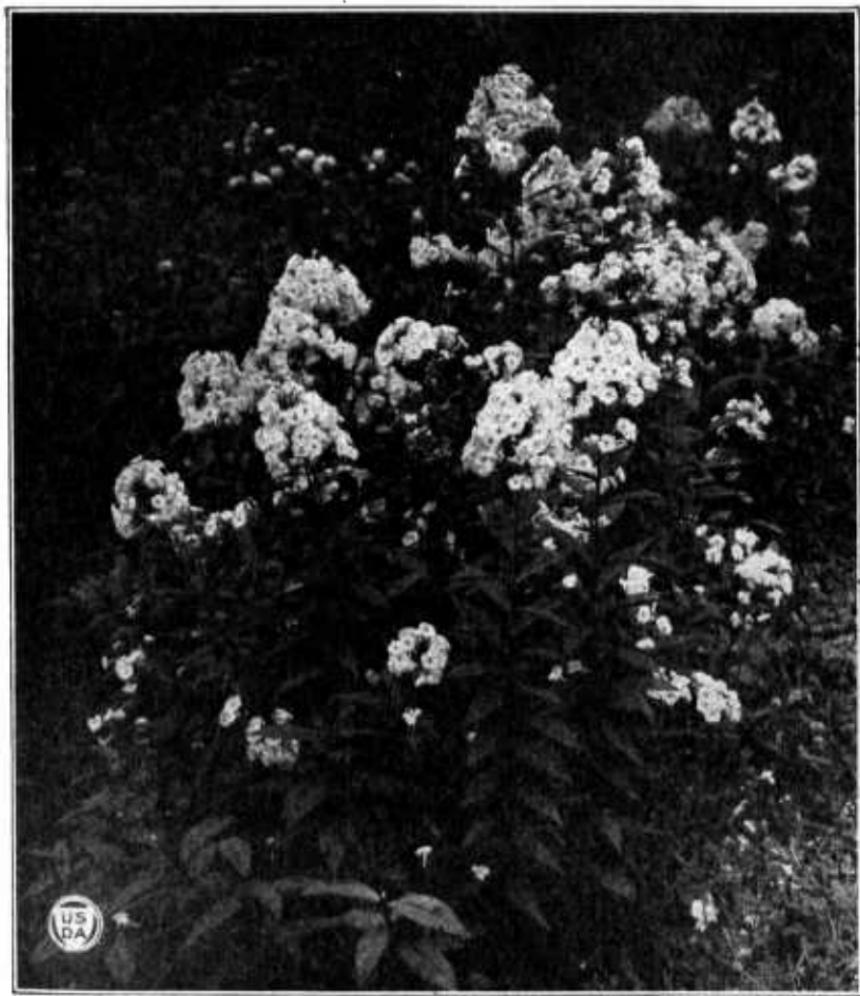


FIG. 35.—Hardy garden phlox.

rockery, although the carnation is not satisfactory outside of greenhouses and only then in relatively cool climates.

The clove pinks grow 1 to 2 feet high in rather compact clumps, with bluish grasslike foliage, scarlet, pink, and white flowers in summer and are propagated from seeds, layers, and cuttings. These are useful border plants but need water in climates as dry as California.

The maiden pink (*D. deltoides* L.) grows 6 to 9 inches high in tufts or spreading mats (fig. 34) with narrow foliage, giving in early

summer an abundance of small crimson-eyed flowers, or in one variety white flowers. It is adapted to borders and rockwork. There are many species of *Dianthus* that are useful as border or rock plants, especially the latter.

PHLOX.

In this group of plants there are several distinct types, some of which are well known in this country. Among these are the tall-growing ones blooming in late summer in gardens and borders; the dwarf ones, mostly spring flowering, much used in rockwork; the semidwarf annual *Drummond* phlox blooming in late summer; and the tall wildwoods and plains species blooming in late spring and early summer.



FIG. 36.—Moss phlox in a rock garden.

The garden phloxes, or those commonly seen in gardens or borders, such as *Phlox paniculata*, *P. maculata*, and hybrids of these two, known by a number of Latin names, including *P. decussata*, grow 2 to 3 or more feet high and flower in midsummer or late summer. They are adapted to all parts of the country except the subtropical, if in the driest sections they are provided with plenty of water at or before blooming; they do better in all places if irrigated at flowering time. A well-established clump will send up many flowering stems well clothed with attractive dark-green foliage. The plants are sometimes seriously affected by a mildew that needs to be kept in check by the application of a fungicide.⁶ The colors vary from white to rose, with a tendency in many cases to a muddy magenta.

⁶ For directions regarding the preparation and use of fungicides, see Farmers' Bulletin 1371, Diseases and Insects of Garden Vegetables; also Farmers' Bulletin 750, Roses for the Home.

There are a large number of named varieties, many of which are very handsome. (Fig. 35.)

They thrive in any good garden soil, but should have plenty of manure and moisture at flowering time. They do best in full sun, except in the warmer regions like California and regions 17, 30, 31, and 32, where they do better in partial shade. Digging and divid-



FIG. 37.—Wild blue phlox.

ing the clumps should be done at least every three years. They are useful in the border, for naturalizing, and for cut flowers.

Varieties must be propagated either by division of the old clump or by root or stem cuttings and are very readily grown from seed also if planted as soon as ripe in early fall. If held until spring the germination is extremely poor. As varieties do not reproduce themselves in this way, a large proportion of the seedlings are likely to be of undesirable colors, requiring the discarding of many if an attractive collection is to be maintained. If this close selection is followed, probably seedlings are better than named varieties, as they

are likely to be more vigorous. Because these plants grow readily from self-sown seeds and the seedlings are often more vigorous than selected varieties, a close watch must be kept over varieties to be perpetuated, or it will soon be found that they have been crowded out by these vigorous volunteers. Frequently such a transformation is attributed to the desirable variety having changed, but if the growth had been closely watched it would have been found that it had been crowded out.

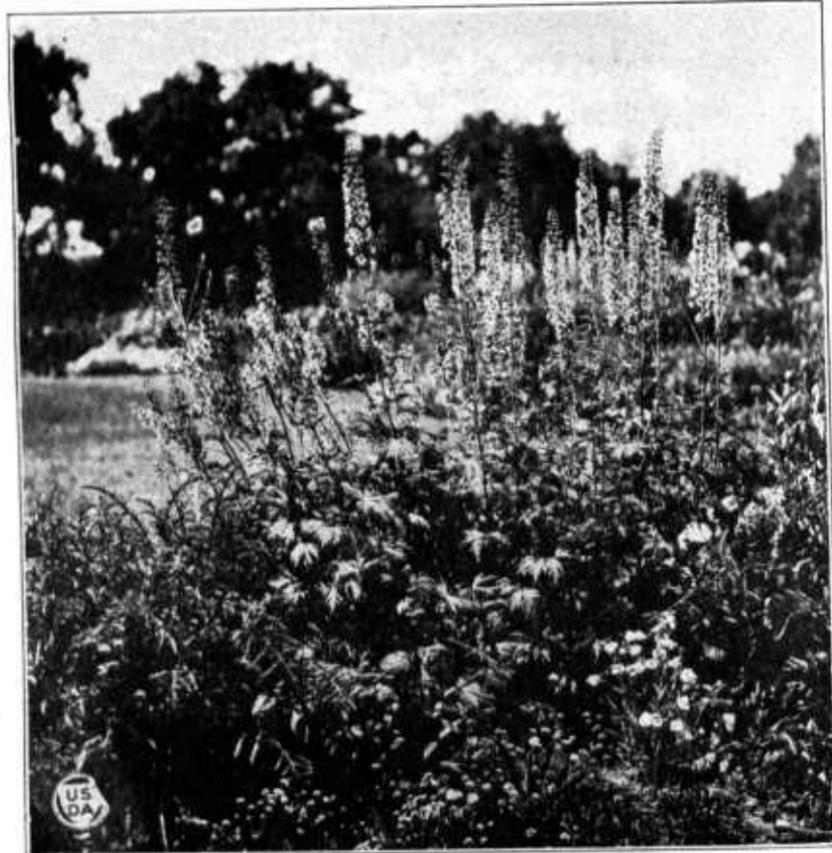


FIG. 38.—Delphinium, or hardy larkspur.

The next best-known group of phlox is probably the moss pink (*P. subulata* L., fig. 36) or ground pink, better called moss phlox or ground phlox, and mountain pink (*P. ovata* L.) and other dwarf phloxes, including some California and Colorado native species of like habit. These species are native on dry banks and in fields from New York south and west through Missouri at least. They are useful throughout the United States, except in the warmest regions, such as 10, 11, 17, 31, and 32. They require some water in the warmer and drier sections, grow to a height of 4 to 6 inches in tufts or mats, and have small, stiff leaves, and light lilac, pink, or white flowers in masses covering the whole plant. They want a well-

drained soil, a dry clay loam being satisfactory, and are useful as an edging for a border or in rockwork.

Among the native woods and fields phloxes, probably the best known is the wild blue phlox (*P. divaricata* L., sometimes known as *P. canadensis* Sweet, fig. 37), miscalled wild sweet-william. It is native over more than the eastern third of the United States and can be grown over the whole area except in the subtropical sections. It grows from 10 to 18 inches high, with a few stems having the appearance of being "leggy" as it grows in the wild, the foliage not being sufficient to give a robust appearance to the plant. It grows on clay loam, preferably where moist and rich, and the flowers come in spring, being blue or pinkish blue. It is good in the border

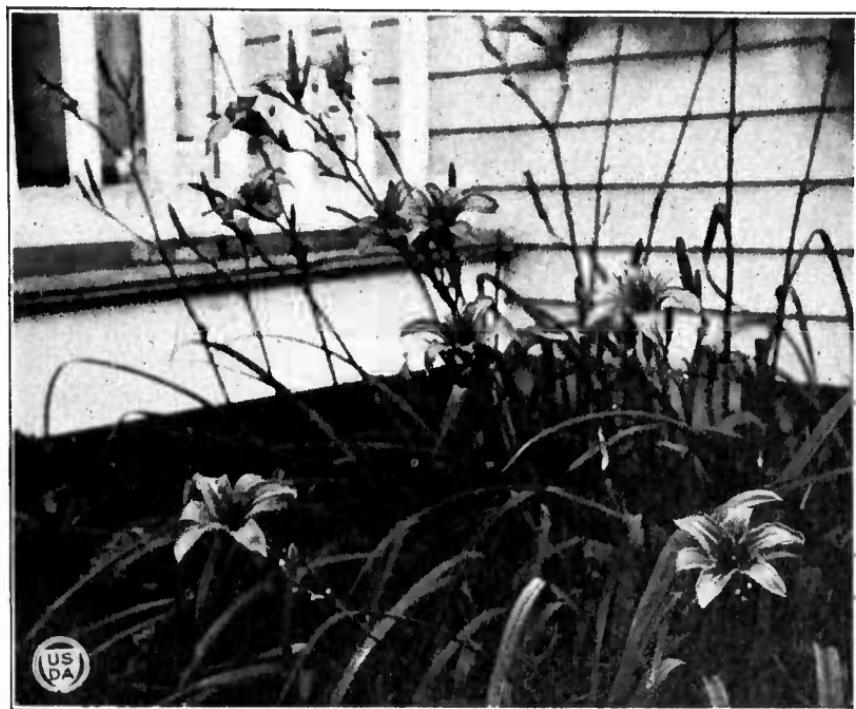


FIG. 39.—Tawny daylily.

or to naturalize in rather sunny situations, although it thrives in moderate shade. The native plants are in danger of extermination because the showy flowers attract attention. As the stems are tough and the roots do not hold strongly to the soil, the plant usually comes out by the roots when the attempt is made to gather it, resulting in the roots being destroyed.

Many other native species are worth planting in the border or rockery.

DELPHINIUM.

Among the most satisfactory of the hardy border plants are the delphiniums or perennial larkspurs. They are adapted to culture in practically all of the United States. The varieties show chiefly shades of blue with some white forms, although there is a scarlet

and a yellow species. For best results they must have a deep soil well enriched with manure. They rather prefer a light soil, although a heavier soil well drained and amply provided with manure will give satisfactory results.

They will bloom at intervals from early summer until frost if proper attention is given. As soon as the flowers have faded the old flower stalks should be cut in order that new flowering shoots may push out. In California this may be repeated a second time,

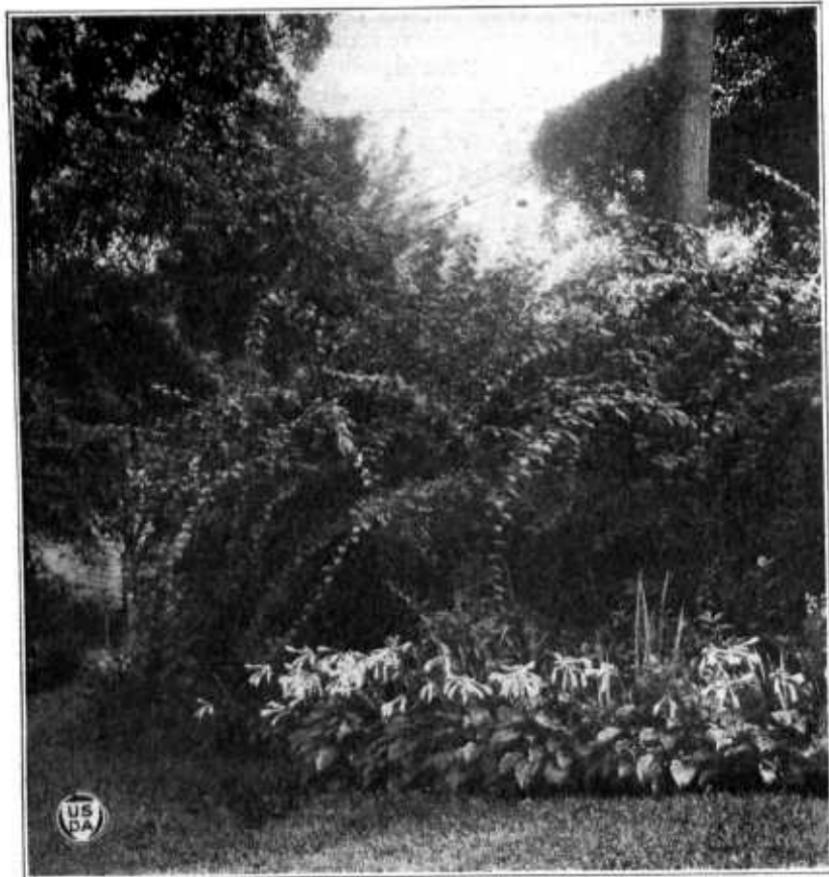


FIG. 40.—August lily.

thus getting three crops of flowers. In order to have continuous bloom through the season, the first flower stalks on part of the plants may be trimmed off before they are half grown, leaving them only 6 inches long. New side shoots will then push out, and these will flower later than the untrimmed plants, thereby prolonging the season.

They are useful in borders, for cutting, and some of the species for naturalizing; others in rock gardens. They are propagated by division, by seeds, and by cuttings either of the new shoots in spring when they are 3 or 4 inches long or of the new growth that comes

out after the old flower stalks are cut. They are best transplanted in spring because of their fleshy roots.

Delphinium grandiflorum is the species of which there are probably the most varieties of any in the trade. It makes a splendid border plant, growing from 2 to 3 feet high, with good foliage throughout the season. The typical flowers are blue, but there are often modifications of the blue color with white and in some cases with a tendency toward yellow.

Delphinium exaltatum is a native of the Mississippi Valley and a most desirable cultivated plant. It grows to a height of 4 feet, with blue flowers having some yellow on the upper petals. It grows wild



FIG. 41.—Lanceleaf plantainlily.

on the edges of woodland, suggesting that it may be grown with a little shade, either in the border or naturalized.

Delphinium fissum (fig. 38) is another species, but, like the two preceding, has a number of named varieties. It, too, is tall, possibly being slightly taller than *D. exaltatum*. Its flowers are blue, with a white beard on the lower petals.

Delphinium formosum is one of the most satisfactory for permanent planting and naturalizing, because of its hardiness. It grows 2 to 3 feet high and has blue and violet flowers having long spurs.

The bee larkspur (*D. elatum* L.) has many varieties attributed to it, but probably most of them are forms of *D. exaltatum*. It, also, is a tall larkspur, growing to 6 feet, and is a very satisfactory native species found in the borders of woods from Minnesota to Alabama.

In addition to those mentioned there are a number of varieties grouped under the name of *D. cultorum*, the affinities of which are by no means clear.

In all these delphiniums the differences are more botanical than horticultural, the choice being merely a matter of personal preference. It is an interesting field for the gardener to explore, with full assurance of obtaining something worth while, irrespective of the variety selected.

In addition, there are a number of other interesting species, many of them natives, among which is *D. cardinalis*, a bright-red California species growing to a height of 3 feet and even higher under favorable conditions. Its hardiness, however, is doubtful, except in the warmer parts of the country.

All the dwarf varieties and species are useful in rock gardens where upright plants are appropriate.

DAYLILY.

There are two distinct types of plants that pass under the name of daylily. Both of these are useful, and each has a distinct place to fill in the garden. These are (1) the daylily, the yellow daylily, or *Hemerocallis*; and (2) the plantainlily, or August lily.

Daylilies succeed in all parts of the United States, being as well adapted to culture in the Southeastern States and in California as in the Northeastern States. They grow in compact clumps, with grasslike graceful foliage and clusters of yellow or orange lily-shaped flowers on tall stems in late spring and early summer. They thrive in any good garden soil, but are especially successful in loam near the margin of a pond or a stream, provided the roots are well above the water level. They grow well in sun, but prefer partial shade, especially in the warmer parts of the country. They are useful in the border for naturalizing and for cutting, are propagated by division, and should be reset every three or four years.

The tawny or old-fashioned daylily, or homestead lily (*Hemerocallis fulva* L., fig. 39) is one of the freest growers of this group, but in comparison with some of the others is inclined to be a little weedy in appearance. Its flowers, orange or bronzy in color and borne in abundance, are not fragrant.

The lemon daylily (*H. lilio-asphodelus* L.; also known as *H. flava* L.) is deep yellow and fragrant, a handsome and useful plant growing 2 feet or more high, the flowers extending above the foliage.

The early daylily or dwarf orange daylily (*H. dumortieri* Morren) has leaves only 12 to 15 inches long and the orange flowers borne only slightly above them are not fragrant. This is one of the earliest, if not the earliest, of the daylilies.

The orange daylily (*H. aurantiaca* Baker) is much larger in every way than the early daylily, the leaves being 30 to 36 inches tall, and the flowers of the same orange color are larger and fragrant, growing well above the leaves.

The variety Major is now more generally grown, being even larger and more vigorous. This species and its varieties are inclined to be somewhat tender in the North.

The Japanese daylily (*H. thunbergii* Baker) grows 3 to 4 feet tall, is one of the latest to flower, and has the additional good quality of continuing to bloom the balance of the season if the flowers are kept cut. It is bright yellow, very much like *H. flava*, or lemon daylily, growing in half shade or in sun on any good garden soil.

PLANTAINLILY.

In contrast with the daylilies just described, there is the group of summer and late summer flowering blue and white plantainlilies,



FIG. 42.—Love-entangle, or goldmoss, in a rock garden with other succulents.

often miscalled daylilies, known as funkias, and formerly classed botanically as *Funkia*, later as *Hosta*, but now named *Niobe*. They will thrive in region 1, portions of regions 21 and 22 where there is sufficient moisture, and in regions 23, 24, 25, 26, 27, 28, and 29, doing best in moist shady places. They grow to a height of 1 to 2 feet, with the flowers usually borne well above the very large foliage, and are useful in borders, making fine large clumps if permitted to remain in one place for a few years. They are propagated by division of the clumps, but do best if not disturbed too frequently. Many of the species will grow readily from seed if it is planted as soon as ripe.

The August lily, or white plantainlily (botanically known as *Niobe plantaginea* Nash, but listed in catalogues as *Funkia subcordata*), has white tubular flowers 4 to 6 inches long in large heads, borne a foot or more above the foliage, and having an orange-like fragrance. It is a showy and useful plant (fig. 40). The variety *grandiflora* has larger flowers.

The blue plantainlily (*Niobe caerulea* (Andr.) Nash, but best known as *Funkia caerulea*) has flowers with a slender tube opening suddenly into a bell-shaped nodding flower nearly 2 inches long. It is the commonest of the blue-flowered plantainlilies. There are forms with white borders and also with variegated leaves.

The lanceleaf plantainlily (*Niobe japonica* (Thunb.) Nash, but best known as *Funkia lancifolia*) is the smallest leaved species, having a blade not over 6 inches long and 2 inches wide (fig. 41). The flowers are pale lilac, very late, opening in September, and the variety *undulata* has wavy, white-bordered leaves.



FIG. 43.—*Sedum stoloniferum*, with a pink in the background.

Funkia fortunei), which has flowers borne well above the foliage. The leaf stems are short, so that the foliage is scarcely more than 1 foot high, the flowers being borne at the height of about 18 inches. There are also a number of varieties, many of which are described as related to the Siebold (or cushion) plantainlily, but in reality they are related to *fortunei*.

SEDUM.

The sedum, often called stonecrop, belongs to a large group of plants adapted to all parts of the United States, but especially good for dry, sunny situations. Many of them are native American species, thriving in the drier parts of the country and capable of withstanding severely cold weather. The low, creeping ones are especially good for walls, rockwork, and dry borders, while the larger ones

The Siebold (or cushion) plantainlily (*Niobe sieboldiana* (Hook.) Nash, but better known as *Funkia sieboldiana*) is lilac in color, and the leaves are as tall as the flower stalks, thus partially hiding them. Most of the plants sold as this variety are probably the Fortune plantainlily (*Niobe fortunei* (Baker) Nash, but better known as

are better suited for the open border. Most of them are evergreen, adding greatly to their attractiveness, and they can be used to advantage in narrow strips of ground between the house and the sidewalk in cities if this area is protected from trampling, as, for example, by irregularly placed rocks with soil between. The plants are smothered with panicles of small yellow, white, pink, or scarlet flowers in early summer. The soil must be well drained, most species preferring full sun, and many of them are used for carpet bedding. They are propagated by cuttings, by growing from single leaves, or by seed.

One of the most widely grown of these plants is the love-entangle (*Sedum acre* L., fig. 42), goldmoss, mossy stonecrop, or wall pepper. It has become naturalized in the Eastern States and is especially adapted to poor, dry soils. It forms a dense mat close to the ground, is only about 2 inches high, of a very bright green, and in early summer it is completely covered with bright-yellow flowers, making the name "goldmoss" most appropriate. A single plant will make a mass a foot or more across, but it is more effective in borders when planted sufficiently close together to form a carpet. The variety known as Minor makes mossy cushions.

The white stonecrop (*S. album* L.) grows 4 to 6 inches high and has small, rather thick light-green foliage of spreading habit and white flowers. It thrives in half shade as well as in full sun. There are many varieties, one a smaller plant than the regular form, having reddish stems and foliage.

Some of the other sedums that are more common in cultivation are hexagon stonecrop (*S. sexangulare* L.), 2 to 3 inches tall, very similar to love-entangle, with dark-green foliage and yellow flowers. Oregon stonecrop (*Gormania oregana* Britton, formerly *S. oreganum* Nutt.) is native from Alaska to California and has light-green foliage and pale rose or yellow to pink flowers. The hybrid stonecrop (*S. hy-*



FIG. 44.—*Sedum stoloniferum splendens*.

bridum L.) grows 4 to 5 inches high, bearing yellow flowers in flat-topped clusters 2 to 3 inches across. The orange stonecrop (*S. kamtschaticum* Fisch. and Mey.) grows from 5 to 10 inches high and bears showy yellow flowers in clusters 6 inches across, the foliage consisting of round leaves of a deep green. It is one of the sedums that does well in partial shade. The running stonecrop (*S. stoloniferum*, fig. 43) is prostrate or spreading, but grows to a height of 6 inches. It has pinkish white flower heads and is naturalized in the United States. The scarlet running stonecrop (*S. stoloniferum* variety *coccineum*)

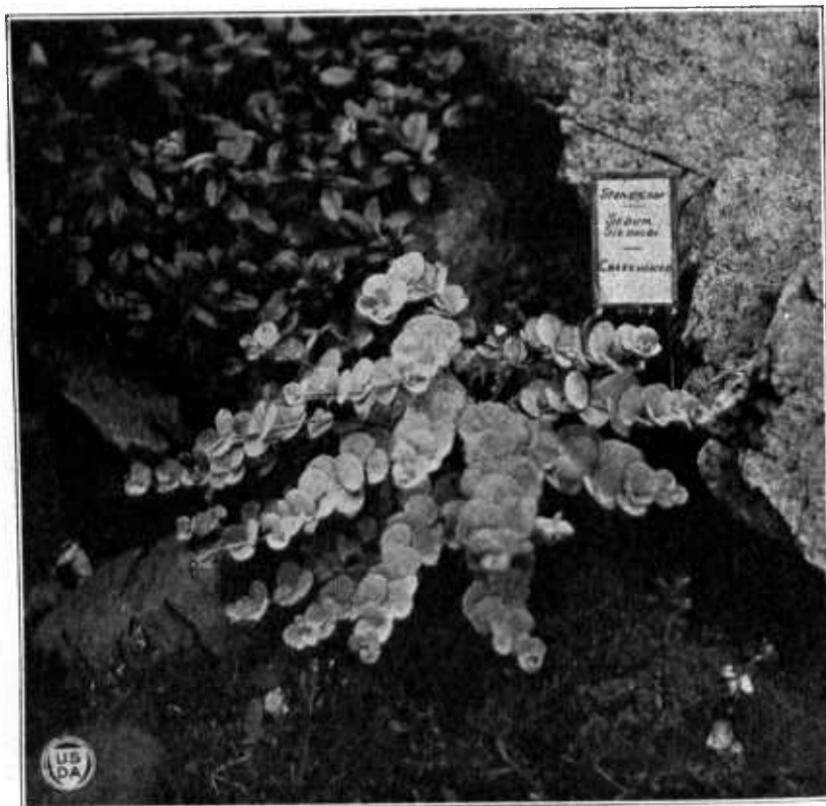


FIG. 45.—Siebold stonecrop.

coccineum) is rose purple, and there are other named varieties, such as *S. stoloniferum splendens* (fig. 44). The roseroot stonecrop (*S. roseum* (L.) Scop.) grows from 5 to 8 inches high, but it is trailing, with reddish purple flowers in clusters 1 inch in diameter. The Siebold stonecrop (*S. sieboldii* Sweet, fig. 45) grows from 3 to 9 inches high. It has bluish foliage, with reddish or pinkish edges, and the flowers are pink or pinkish. There is also a variegated variety. Creeping jenny (*S. reflexum*), naturalized in the eastern United States, has green foliage in a conical mass without being in a close rosette. The yellow flowers are in clusters three-quarters of an inch across. *Sedum rupestre* has round thick leaves that grow closely, forming conical rosettes an inch in diameter. The flower stems grow

from 6 to 12 inches high, having golden yellow flowers half an inch in diameter, the foliage turning reddish with age and drought, and the rosettes form in clusters about the original plant. Liveforever (*S. telephium* L.) grows 12 to 18 inches high on rocky barren situations or in rich moist soil, and its flowers are purple or white with pink spots, but it is not nearly so attractive and useful as *S. spectabile*. *Sedum fabaria*, a close relative, grows to a height of 8 to 16 inches, with narrower grass-green leaves and smaller flowers. Two species very much alike are *S. aizoon* and *S. maximowiczii*, both being about 1 foot high and bearing yellow flowers. The great stonecrop (*S. maximum* Suter) grows 1 to 2 feet tall, has whitish flowers, and is rather better suited to the border than to the rock garden, as



FIG. 46.—Showy sedum; known also as *Sedum spectabile*.

it is apt to need support near the end of the season. It is a variable species, with many varieties. The showy stonecrop (*S. spectabile* Bor., fig. 46) grows 1 to 2 feet tall, has purplish or rose-colored flowers in late summer or early fall, and is one of the best plants for foliage effect through the season, the leaves being a bluish green and attractive. There are many varieties.

YUCCA.

The yuccas succeed in all parts of the country and are especially adapted to the dry and hot regions, although some of them are hardy in cold climates, even where there is snow and moisture. They have long, stiff, comparatively narrow leaves growing from a common center or crown and bear white or cream-colored, fragrant,

cup-shaped flowers on tall, many-branched stalks. They are adapted to subtropical effects, are used both in rock-garden work and in borders, and are especially useful where it is too dry for many perennial plants to thrive. They are propagated by seeds, offsets, and stem cuttings, and also by rhizome cuttings under glass.

Adam's-needle-and-thread (*Yucca filamentosa* L.) is native from South Carolina to Mississippi and south to Florida, but thrives everywhere if the soil is well drained. The leaves form dense clumps 18 inches or more high, but they are greener and less rigid than the western species. The flower stalks grow 6 feet or more

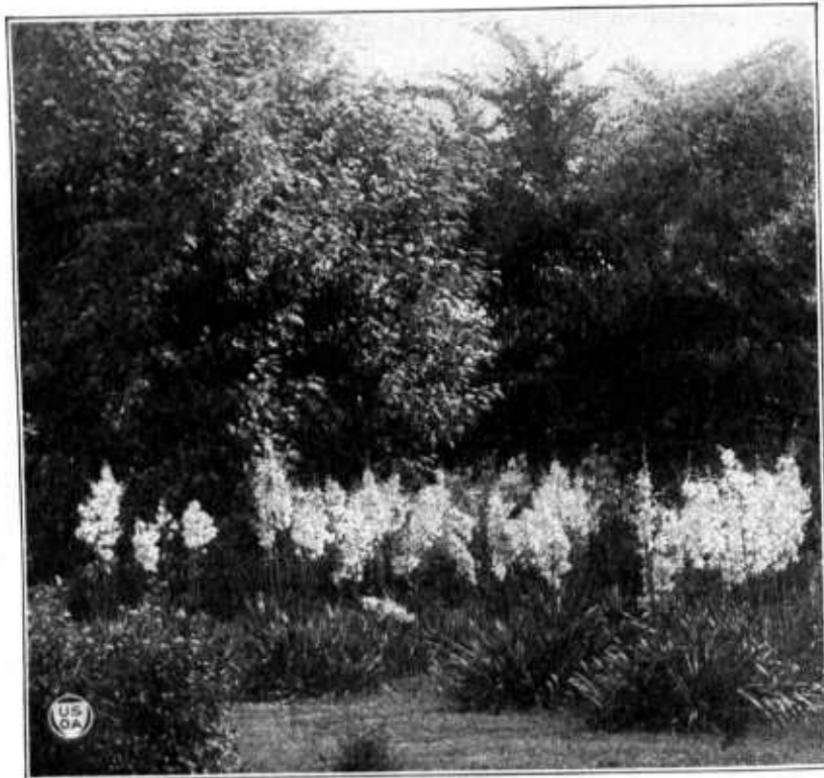


FIG. 47.—Adam's-needle, or yucca.

high and bear many flowers which are smaller than the western species. It blooms in early summer.

Another species, known as Adam's-needle (*Y. flaccida* Haw.), is a native from North Carolina southward and is best known in more northern gardens under the name of *Y. filamentosa* (fig. 47). Its leaves are more limp and recurving than the preceding species, the threads are straighter, and it withstands more cold. There are varieties of these two.

Soapweed (*Y. glauca* Nutt.; also known as *Y. angustifolia* Pursh, fig. 48), sometimes known in New Mexico as bear-grass, is native from South Dakota to New Mexico. It has an underground branched trunk from which large clumps spring. The leaves are

narrow, stiff, and gray-green with a white margin. Each rosette of leaves from the underground stem sends up one stalk of white or purple-tinted flowers. Soap is made from the roots; hence the name soapweed.

Yucca baccata is possibly not adapted to the colder portions of regions 12 to 15, but otherwise is well suited to all parts of the country. It is native from southern Colorado to New Mexico and Nevada. The leaves are thick, but the flower stalks grow only 3 feet high (fig. 49), although the individual flowers are the largest of any species, often 3 inches long.

Yucca harrimaniae, native to Utah, Colorado, and New Mexico, is an alpine that does best in dry situations, but withstands wet. It is the smallest of the yuccas, forming rosettes 4 to 8 inches in diameter and height and composed of a hundred or more stiff needle-like leaves edged with white filaments. It succeeds in all soils, from adobe to sand.

CACTI.

Although cacti are sometimes woody plants, they are usually herbaceous, and their use in the garden is so similar to that of other herbaceous perennials that a short account of them is given here. Several species are used in ornamental planting, and no doubt as gardening increases in the drier sections of the country more and more species will be used. There are cactus gardens (fig. 50) in California and other portions of the West, and some are maintained in connection with eastern botanical gardens, especially greenhouse collections of the more tender kinds, several of which are used for bedding. Only a small proportion of these plants thrive in the northern part of the country; but there are enough that succeed, so that in connection with some of the other succulents and rock plants creditable results can be made on poor, dry banks or similar locations too dry for the ordinary type of perennial to thrive.

They are especially useful in the warmer parts of the drier regions of the country, many of the species being native from Colorado



FIG. 48.—*Yucca glauca*; also called bear-grass, or soapweed.

southward and two or three even as far north as Canada. The conspicuous parts are stems, as most of the species are without leaves, but in spite of this many are very attractive, due to the showy flowers, fruits, and in some cases thorns, while others are grotesque or interesting rather than pretty. They are especially interesting in dry regions where other types of vegetation do not thrive, as they need well drained situations. The propagation of these plants is by cuttings, seeds, or offshoots, depending on the group to which they belong. Those propagated by cuttings are easily rooted in sand, especially if the cut surface is dried a few days before planting.

If seeds are the means to be used, they should be well ripened and then dried, germinating much more surely and rapidly in May and June than earlier. The seed bed must be of light, well-drained soil, and the seeds should be covered with sand to enable them to come through easily.

The opuntias, or pricklypears are cacti that vary in height from only a few inches to trees of 20 feet or more. If the season is long enough for the fruits and plants to ripen, the hardier species seem able to withstand any degree of cold, even in a moist climate, which they will do wherever the season is long enough.

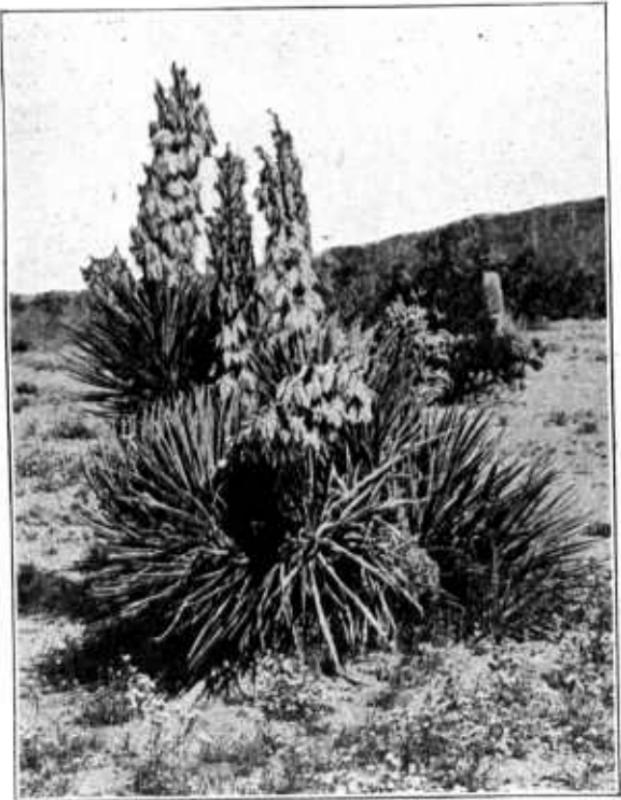


FIG. 49.—*Yucca baccata*.

for Indian corn to succeed. They are of many kinds, prefer soil not too heavy, and like lime. Yuccas are appropriately used with them. They are propagated from cuttings or from seed.

The Missouri pricklypear, or the many-spined opuntia (*Opuntia polyacantha*; also listed as *O. missouriensis*, fig. 51) is native from the Missouri River Valley southward and westward and is hardy even in the moist climate of Massachusetts. It is spreading, growing to a height of 12 inches, but has many forms. Its flowers are yellow.

Opuntia humifusa, native to the Mississippi Valley, also has many forms, all of which are very hardy. It, too, is prostrate, often forming large mats of green oblong joints which are not very spiny.

It bears yellow flowers profusely in midsummer, followed by showy purple fruits.

Opuntia phaeacantha is native to the southwestern United States and adapted to culture at least in the whole southwestern quarter, even including region 22. It is one of the dwarf opuntias, growing to a height of 1 to 2 feet, with a semiprostrate habit, large bluish joints with a purplish tinge, very stout dark spines, deep yellow flowers, and purple fruits. There are many other useful species.

The echinocactus is another large group of American succulent plants. The former genus of this name has recently been divided into several genera much alike horticulturally, the one shown in Figure 52 being typical, although this plant is now called *Homalocephala texensis*. They are globular, strongly ribbed, spiny, and

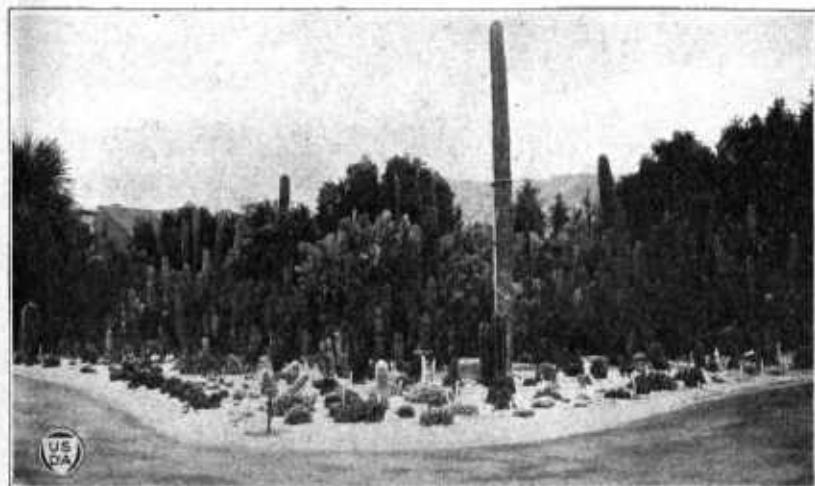


FIG. 50.—Different types of cacti as seen in a cactus garden.

like well-drained soil, preferably light or sandy, with full sun and not too much moisture. They are propagated by seeds.

Echinocactus polycephalus is native from Utah to California, growing in clusters suggestive of cannon balls, each one being from 5 to 10 inches in diameter and from 10 to 16 inches high, bearing yellow flowers, while *E. viridescens* is native to southern California, growing from 6 to 10 inches in diameter, much flattened, only 4 to 8 inches high, and bearing yellowish green flowers.

The snowball cactus, also called plains cactus (listed in catalogues as *E. simpsonii* but by botanists as *Pediocactus simpsonii*), is native to the mountains from Colorado northward and grows as a ball 3 to 6 inches in diameter with interlacing brown or gray spines in starlike clusters, bearing small showy pink flowers in early spring.

Another group of the dwarf, often globular cacti are the nuammilarias (often spelled mamilaria). (Fig. 52.) Most of them are native farther south than the groups already mentioned, but several of them are reasonably hardy. The culture is the same as echinocactus.

The star cactus (*Mammillaria missouriensis* Sweet) is native from Montana to Kansas and eastern Colorado, while some of the varieties are native to Texas. It is small, 1 to 2 inches in diameter, dark green with a star of gray spines at the top of each tubercle and yellow flowers 1 inch in diameter followed by red berries the size of a pea. *Mammillaria grahamii* is native from Texas to Arizona, and the flower is rose colored.

Echinocereus is another group of these plants having short spines and handled in the same way as those just described. The flowers may be yellow, but are usually purplish or scarlet. The strawberry

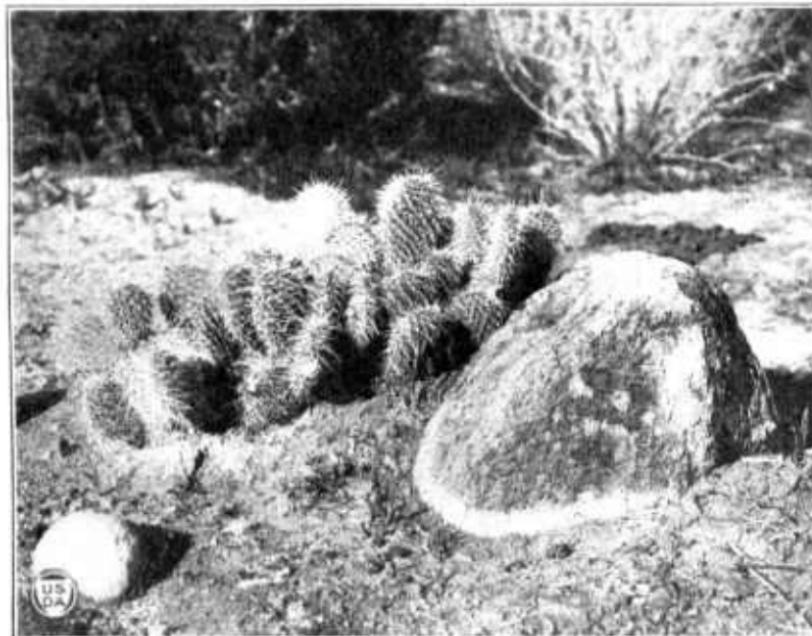


FIG. 51.—A many-spined opuntia.

cactus or cob cactus has large beautiful purple flowers (fig. 53) followed by edible fruits. The rainbow cactus (*Echinocereus rigidissimus* Rose) has very large purple flowers, while the green-flowered petaya (*Echinocereus viridiflorus* Engelm.) is cylindrical, 1 to 2 inches in diameter, and 3 to 7 inches in height, with brilliantly colored spines in clusters along the perpendicular ridges, having bands of color about the plant.

Bergerocactus emoryi is common on the coastal hills of southern California. It is a very attractive plant, growing 2 feet high in dense masses and produces small yellow flowers.

There are many other genera and species, many of which are suitable for outdoor culture, but not widely handled by growers of perennials.

RUDBECKIA.

Rudbeckia is another family of plants having species that do well in the semiarid regions if given some water. They grow well all over

the United States, some being native from the Rocky Mountains to the Atlantic Ocean. They have yellow flowers with brown centers, blooming in summer and fall, and are useful for the border or for naturalizing, preferring open, sunny situations. They are of easy cultivation and propagated either by division or by seed.

The goldenglow (fig. 54), a double form of *Rudbeckia laciniata* L., is probably one of the best known in gardens, growing to a height of 10 feet under favorable conditions, although more often 6 to 8 feet high. It needs transplanting frequently, perhaps every two

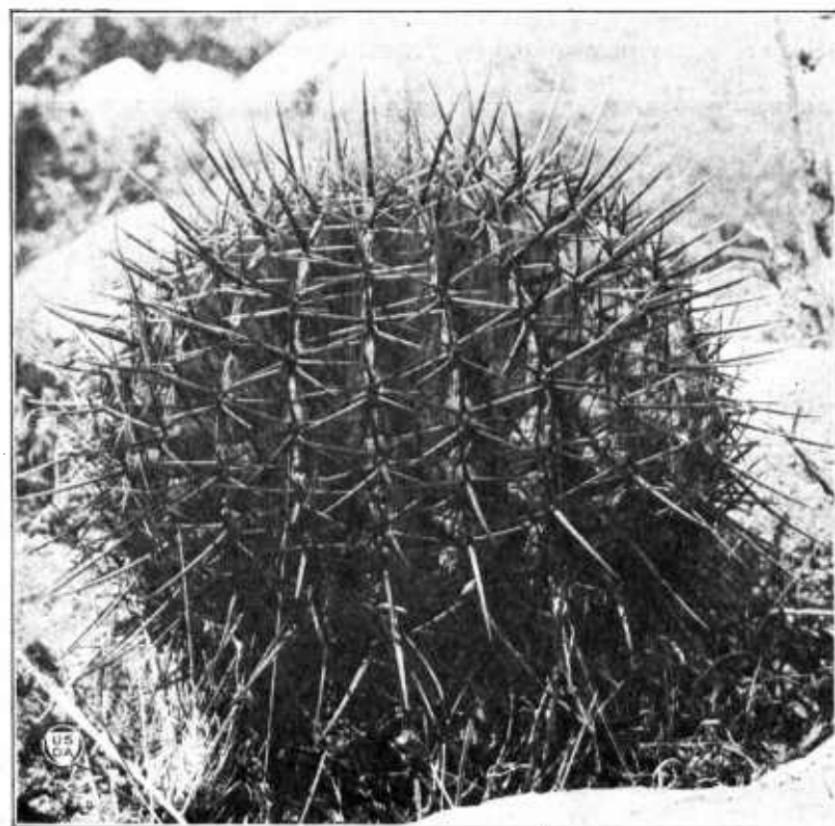


FIG. 52.—An echinoactus.

years, to prevent its becoming too much matted. The single form is native from Canada to Florida and from the Atlantic to Montana and New Mexico, growing from 3 to 8 feet high.

Autumn Sun and Autumn Glory are two varieties of *R. nitida* (fig. 55), having some advantages even over the goldenglow. This species is native from Georgia and Florida to Texas, growing 2 to 4 feet high, with yellow flowers in summer and fall.

Rudbeckia hirta L., blackeyed-susan, yellow daisy, and (in the West) niggerhead, is an annual or biennial, common over a wide range, often becoming a bad weed, and growing to a height of 1 to 3 feet. There are several other species, all good.

SUNFLOWER.

Many of the sunflowers are excellent border plants, some are good for cutting, and all have yellow flowers, blooming in summer or fall. Most of the perennial species are less coarse than some of the annual kinds and are of easy culture in ordinary garden soil with sufficient moisture, though some of the varieties thrive with less water than others; but nearly all succeed even in California if given a moderate quantity of water. The species are propagated either from seeds or by division, but the varieties do not come true from seed, so they must be propagated by division, and some of the more variable species are better propagated by division for the same reason.

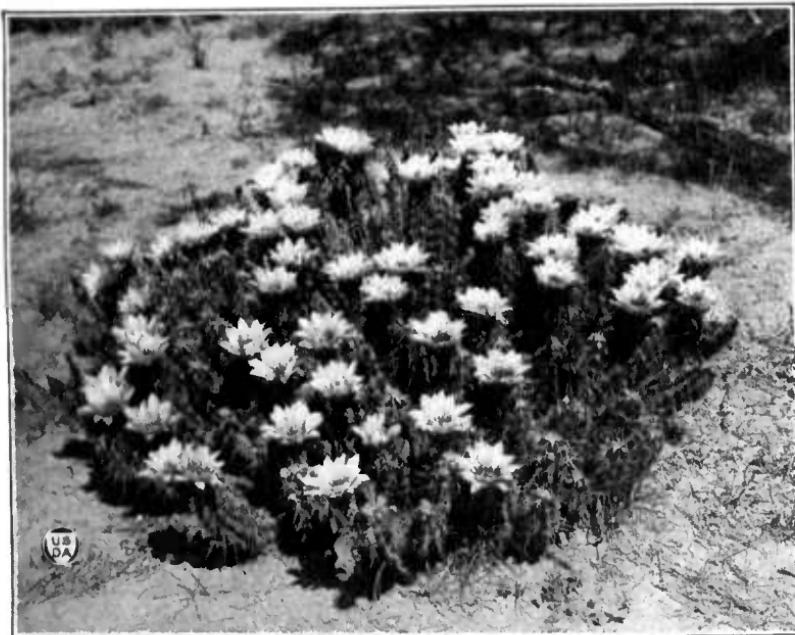


FIG. 53.—An *echinocereus* in flower.

Varieties of *Helianthus decapetalus* are probably among the most satisfactory of these plants. (Fig. 56.) This species is native on moist soils from Canada to Georgia and west to Michigan and Kentucky, growing 3 to 5 feet high and blooming from July to September. One of its most important varieties is *multiflorus*, of which there are many named varieties varying greatly in the amount of doubling. All are desirable for cutting as well as for border plants. Soleil d'Or being one of the attractive very double forms. If permitted to remain too long without transplanting and dividing these double forms deteriorate very much.

Another species of sunflower that has several good double forms is *H. rigidus*, often incorrectly called *H. scaberrimus*, native from Minnesota to Illinois and Georgia and on the Texas prairies. It grows usually 1 to 3 feet tall, but sometimes reaches more than 6

feet, blooming from August to October. The disk, as well as the rays, are often yellow at first, with the disk turning brown later. One of several good varieties is Miss Mellish.

There are also many other species that thrive over a wide range of territory which are useful border plants.

HELENIUM.

The heleniums, or sneezeweeds, are closely related to the sunflowers, both botanically and horticulturally, and may be used in the same way among shrubbery, as backgrounds, for borders, or wherever tall, somewhat coarse-foliated plants would be suitable, but are more valuable for borders because they do not spread by wide-growing underground stolons as do the sunflowers. A deep moist soil is best.

Helenium autumnale (fig. 57) is native in moist places from Canada to Florida and west to South Dakota, Kansas, and Alabama, growing 2 to 6 feet high, and bearing yellow flowers from August to October. Many of the varieties assume orange tints; the variety *rubrum* is described as having red flower heads, while others closely approach red.

Helenium hoopesii, is a Rocky Mountain species growing 1 to 3 feet high, its greatest claim to favor being that it is the earliest of composite flowers to bloom, giving an abundance of flowers from May until frost. It is fine both as a border plant and for cut flowers.

There are several other species of perennial heleniums, all of which are worthy of culture. Some of the named varieties, such as Riverton Gem and Riverton Beauty, are widely cultivated.

HOLLYHOCK.

The hollyhock (*Althaea rosea* Cav.) is one of the oldest plants in cultivation, having been found in Chinese gardens in many colors by the earliest recorded European visitors to that country. They are



FIG. 54.—Goldenglow.

suited to all parts of the United States and generally thrive in any deep garden soil. In the drier sections they need water, although here they do fairly well even if neglected. They are primarily a sun-loving plant, but do well in partial shade, especially in the hotter parts of the country. They grow to heights of 5 to 8 feet or more, flowering along straight stems (fig. 58) in early summer. The individual flowers are bell-shaped, 3 inches and more in width, with separate petals of vivid colors from white through pink to scarlet and the deepest maroon, often described as black, while some of the paler shades might almost be described as gray. There are double as well as single forms, and they respond to plenty of fertility in a well-drained soil. Propagation is usually by seeds, which should be sown as soon as ripe, especially if the plants are to be treated as biennials and provision made for each year's flowering. Commercial seed



FIG. 55.—*Rudbeckia nitida*.

comes about 60 per cent true, but in the home collection there will be a tendency to run to single pink if there are any of the commoner varieties near from which the bees can carry pollen and thus cross with the others. Transplanting these plants should be carefully done, preferably in the spring, as the roots are large and the growth is from a few strong buds at the crown, which need to be well protected or the whole plant is lost. They should be planted with the strong main roots extending downward and the crown a little below the surface. If planted in the fall, there is great danger of the plants heaving and exposing the underground roots, which are liable to die soon after flowering, if not before, thus killing the whole plant unless it is reset in the spring. It is desirable to mulch well between the plants, covering them lightly. They are useful in the border, but will do well against shrubbery if the base of the plant is not shaded.

In many places there is trouble with the hollyhock rust (*Puccinia malvacearum*), and sometimes the attempt is made to control it by

spraying, but if good cultural conditions are provided, including a deep, well-drained soil and careful handling, there will be little likelihood of trouble from this source.

The figleaf hollyhock (*Althaea frifolia* Cav., which has been called Antwerp hollyhock) is much grown in California and by dealers in these plants in Michigan, so there seems to be no reason why it should not succeed wherever the common hollyhock is grown.



FIG. 56.—*Helianthus*.

ROSEMALLOW.

The rosemallow, often miscalled marshmallow, belongs to a closely related group of plants with hollyhocklike flowers that bloom in late summer and fall instead of in early summer. (Fig. 59.) These plants grow as bushes, with several stems and foliage along them, instead of in clusters of radical leaves with flowering stems

having little foliage. Although naturally swamp-loving plants, they thrive in any good garden soil, but require some water in the drier regions of the country. The colors are similar to those of hollyhocks, but they do not vary through quite such a wide range. They are useful in gardens, borders, and in open spaces with shrubbery;



FIG. 57.—*Helenium autumnale*.

but as they require rather full sun they will not thrive if too much crowded. They are readily increased from seed and by division, the latter being the method necessary for the improved varieties.

Two improved hardy types of these plants are (1) Meehan's Marvel mallows, said to be hybrids of *Hibiscus coccineus* Walt., *H. militaris* Cav., and *H. moscheutos* L., and (2) the giant-flowered rosemallow listed in catalogues as *H. moscheutos* hybrids and said to

be hybrids of *H. coccineus* and *H. moscheutos*. Some of these hybrids have flowers 10 inches in diameter.

The best-known species is the common rosemallow (*H. moscheutos* L.) native in marshes from Massachusetts to Florida and west to Lake Michigan. It is easily collected, as are also the seeds, and it is well worth growing. A close relative is the crimson-eye rose-

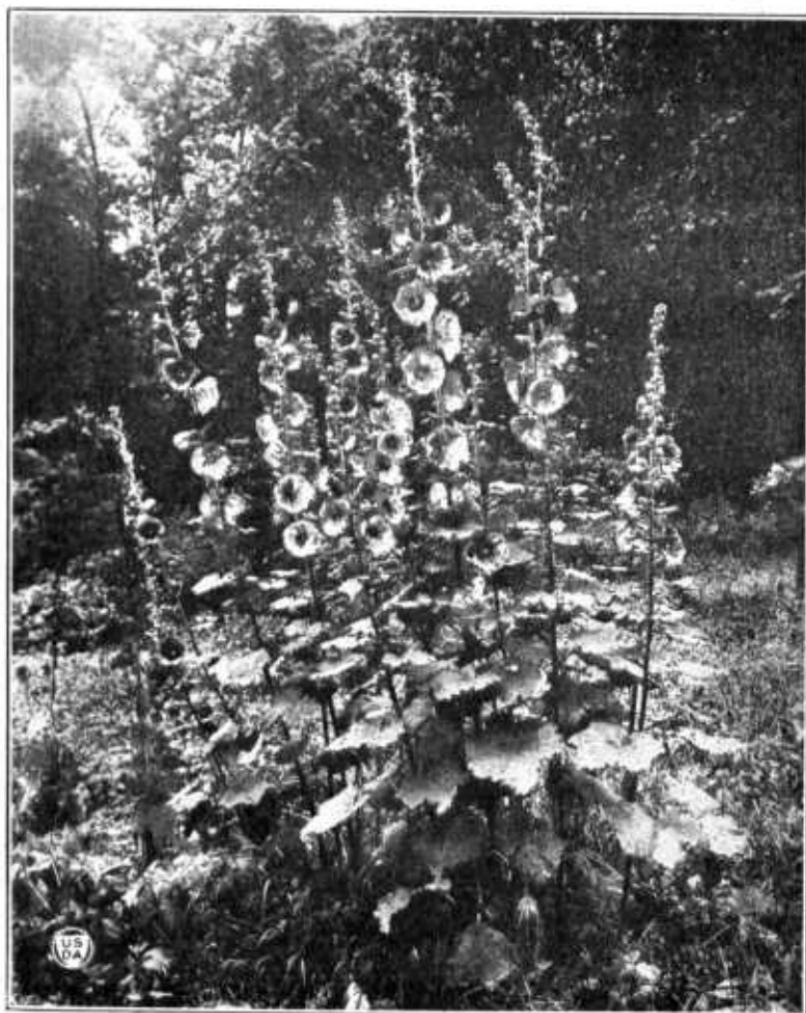


FIG. 58.—Hollyhock.

mallow (*H. oculiroseus*), native near the Atlantic coast from New Jersey southward. *Hibiscus militaris* is native from Pennsylvania to Minnesota and southward to the Gulf and *H. lasiocarpus* from Kentucky southward and westward. Both of these are good border plants. *Hibiscus coccineus*, native in swamps from Georgia southward, is a handsome species and can be grown north of its native region, on the Pacific slope, and in regions 17, 20, 25, 28, 29, 30, 31, and 32.

There are many other species that are tender, and some shrubby species are worthy of cultivation where climatic conditions warrant.

ANEMONE.

The windflowers, or anemones, are widely distributed, many species being native to America, though some are adapted only to the cooler parts of the country. Many kinds are good garden or border plants, while others are suitable only for fern gardens or for naturalizing



FIG. 59.—Rosemallow.

in woodlands. The season of bloom varies from early spring until fall. They are well adapted to shady positions and in the warmer parts of the country succeed only in such situations.

The Japanese anemone (*Anemone japonica* Sieb. and Zucc.) is probably the best known in gardens. (Fig. 60.) It is adapted for use in all except the northern parts of the country, regions 7, 12, 15, 18, 21, and 26. They bloom in the fall and have white, pink, or rose colored flowers on stems that sometimes grow to a height of 5 feet.

Anemone canadensis, probably better known to gardeners as *A. pennsylvanica*, is native throughout North America in woods and open meadows. It grows naturally to a height of 1 to 2 feet and has white flowers in summer, but there are named varieties that are improvements on the native species for garden culture.

Anemone coronaria L., the poppy anemone, grows about 1 foot high and has white, pink, red, and blue varieties that come from early spring until the beginning of summer. It is useful in warm as well as cool climates. The variety *chrysanthemiflora* is an old double form that has produced red, sky-blue, and white named varieties. It is especially adapted to California and places having similar conditions.

There are many other species, all suitable for the garden, among them the small rue anemone (*Syn-desmon thalictroides* (L.) Hoffmannsegg). (Fig. 61.)

LILY-OF-THE-VALLEY.

The lily-of-the-valley (*Convallaria majalis* L.) is native in the Appalachian Mountains from Pennsylvania into South Carolina, as well as in Europe. It is a well-known and much-prized garden plant, bearing racemes of dainty, bell-shaped, sweet-scented flowers in spring (fig. 62) and

adapted to all the cooler portions of the country where there is plenty of moisture, if shade can be provided. It will also thrive in full sun in well-prepared beds if supplied with moisture and annual top-dressings of manure, but even here it will need re-planting in 4 or 5 years. Under ordinary garden culture it over-crowds in about 4 years, as shown by a reduction in the number of flowers, and then needs digging and separating. Selections can be made from the strongest roots, and these should be separated, so that there will be about half a dozen shoots to a clump. When prepared



FIG. 60.—Japanese anemone of unusual vigor.

for forcing in the greenhouse the roots are grown for a short time in well-enriched beds; when these are dug the buds with their roots are separated and sold under the name of "pips." Masses of roots with several buds are called clumps.

It succeeds in moderately rich soil. The plants are best set in late summer with the buds about 2 inches below the surface of the ground.

GRASSES.

In addition to many other flowering plants not mentioned in this bulletin which can be used for the purposes already described, grasses are also available for adding attractiveness and variety.



FIG. 61.—Rue anemone.

Such plants as the Japanese eulalia (*Misanthus sinensis* Anders.) with green leaves, the striped eulalia (*M. sinensis variegatus*) with yellow, lengthwise stripes, the zebra grass (*M. sinensis zebrina*) with yellow crosswise stripes, the maiden grass (*M. sinensis gracilima*) with narrow leaves and a silvery midrib, the hardy fountain grass (*Pennisetum japonicum* Trin.), the purple fountain grass (*P. ruppeli* Steud.), the white fountain grass (*P. longistylum*), the pampas grass (*Cortaderia argentea* Stapf, fig. 63), and the arundo or giant reed (*Arundo donax*, fig. 64) are all useful over a wide territory, and even the bamboo (*Bambusa*) has species that succeed in a large part of the country.

FERNS.

As already mentioned, ferns as a rule need conditions differing from those required by border plants for their most successful cultivation. These include a soil retentive of moisture, an abundance of leaf mold, partial shade, and especially an acid soil produced by the leaf



FIG. 62.—Lily-of-the-valley.

mold. On the other hand, ferns do not want the soil too spongy, but need to reach the soil beneath the leaf mold in order to have access to the mineral matter there. Some varieties grow in sunshine even in dry places, and those that grow naturally in shade will often succeed in full sun, if other conditions are favorable.

Ferns as a rule are not difficult to establish and if not interfered with too much maintain themselves a long time. The principal attention needed is a supply of water if the location or season make that necessary and a removal of weeds if any are inclined to start among them. In the drier parts of the country they must be provided with water, either by planting in a naturally moist location, which is hard to find, or by timely irrigations. Each region has some ferns particularly suited to it, although most of the commoner kinds are widely distributed and thrive in many different localities.



FIG. 63.—A clump of pampas grass.

The deciduous kinds may be helped by a mulch of leaves, which must not be too heavy, as even a light mulch may have to be removed in part before growth starts in the spring. The evergreens will usually do better with a very light mulch or none at all.

The time of transplanting depends upon the type. The evergreen ferns may be moved at any season when the soil is not too cold for the formation of new roots. The usual precautions necessary in the moving of other evergreens must be observed, that sufficient soil be taken with the roots and watered frequently until they become established. The deciduous ferns having a crown and cluster of fronds produce but one set a year, so they must be moved while dormant, especially those with fragile fronds. The deciduous ferns

with creeping stems that spread freely and form masses sending up a crop of fronds in the spring and more during the season may be transplanted at any time.

One of the largest of the widely distributed American ferns is the cinnamon fern (*Osmunda cinnamomea* L., fig. 65), growing 2 to 6 feet high in all parts of the country in sandy loam that is reasonably moist. It will succeed in sun if the soil is suitable, but does not reach its best until three years or more after transplanting, which should be done while dormant.

The Clayton fern (*O. claytoniana* L.) grows only slightly lower than the cinnamon fern but thrives on drier ground. The largest of this group is the royal fern (*O. regalis* L.) which has fronds



FIG. 64.—Giant reed (*Arundo donax*) in the center of a bed surrounded by different varieties of eulalias, or ribbon grasses.

that under good conditions may reach a height of 10 feet. Its moisture requirements are comparable to those of the cinnamon fern.

The genus *Dryopteris*, formerly generally known as *Aspidium*, has a large number of useful ferns that grow to a height of about 2 feet. Most of them are wild over a large part of the country and as a rule are easily handled. The American shield fern (*Dryopteris spinulosa intermedia*, fig. 66) is largely collected for the use of florists, being one of the commonest ferns in eastern woods. It keeps well after cutting, having the finest cut leaves of any of the large evergreen ferns. It must have shade in summer and does best if it has it the year through. It is probably the best species to grow under evergreen trees.

Another species, the male fern (*D. filix-mas* L. Schott) is also widely distributed. It, too, is largely collected and sold in markets, but it is next to impossible to get it to grow from plants collected when in full leaf. It is nearly evergreen and grows in full or part

shade. The New York fern (*D. novaboracense* Gray) is deciduous, with fronds that are broadest in the middle. It thrives in full sun in good soil as well as in part shade and is easily transplanted at any season, but does not stand a heavy mulch of leaves. *Dryopteris cristata* is native from Canada to Arkansas. In New England it is found around old stumps and decayed trees in open meadows and is one of the best ferns in cultivation.

The Aspleniums, another group of ferns of easy culture, have species that are from 1 to 3 feet in height and thrive on the Pacific coast as well as in the Rocky Mountains and eastward.

The maidenhair fern (*Adiantum pedatum* L., fig. 67) is native in the Northern States, while its close relative, *A. capillus-veneris*, is



FIG. 65.—Unfolding fronds of the cinnamon fern.

native southward. They need a rich soil, retentive of moisture, and plenty of leaf mold. If supplied with these, the maidenhair fern will thrive in full sun, at least in the north. The palm-shaped, much-compounded leaves, or, more technically, fronds, with their black stems and pretty leaflets, are always an object of admiration.

Some of the other genera supplying good ferns that may be obtained from dealers are *Dennstaedtia*, *Camptosorus* (or walking fern), *Phegopteris* (which includes the beech fern), *Polystichum* (including the Christmas fern, fig. 68), and *woodsia*.

In the wild or fern garden many native wood plants (fig. 69) can be grown, like the trillium or wakerobin; *dicentra*, including Dutchman's-breeches and squirrelcorn; *cypripedium*, or ladyslipper; *erythronium*, the dogtooth violet, for which the name trout-lily has been suggested; many lilies, native iris, gentian, the trailing arbutus,

bluet, and numerous others. Many of these are grown by dealers in herbaceous perennials.

BULBOUS PLANTS.

Among the first flowers to bloom in the spring are some of the bulbous plants, such as the snowdrops, scilla, glory-of-the-snow, followed by crocus, the various kinds of narcissus (fig. 70), and other so-called Holland bulbs. These, and many of the later flowering bulbs, may be handled in the same manner as other perennial plants. By planting in beds, borders, or naturalizing they can remain for three or four years and then should be dug and reset the same as other perennials, as they will multiply and become too



FIG. 66.—American shield fern in its native haunt.

crowded for satisfactory results. They may also be mixed with other perennials in such combinations that flowers may be continuous throughout the season.

In addition to the early flowering bulbs already suggested, the lily family offers many different kinds, with a wide range of possibilities both in color and height as well as hardiness and ease of culture. (Fig. 70.) These are later flowering, but are valuable for border planting. Some of the much advertised kinds are more difficult to handle than many of the cheaper, less lauded varieties.

Among nearly related bulbous plants of similar appearance are the crinums that are especially useful in the southern half of the country. The hardiest of these are *Crinum longifolium*, *C. moorei*, *C. powelli*, and *C. variabile*. These are hardy as far north as the Ohio River, and farther south many other species will winter without killing.

REGIONS WITH SIMILAR GROWING CONDITIONS:

As already stated, the different parts of the country provide a great variety of growing conditions. Some of the perennials are adapted to many of these conditions, others to but a few. In order to make these variations as intelligible as possible, a map (fig. 71)



FIG. 67.—The maidenhair fern.

has been prepared, in which the areas with approximately similar growing conditions are specified by numbers within heavy border lines. In the following pages the general characteristics of these regions are discussed, with suggestions of the types of perennials that may be expected to grow in each. This is followed by a table showing in which of these regions the perennials described in this bulletin may be expected to thrive.

REGION 1.

Region 1 includes the whole North Pacific coast from below Santa Cruz Bay to the Canadian line. Its characteristics are cool, dry summers with frequent fogs and heavy winter rainfall, with lowest



FIG. 68.—The Christmas fern in its native haunts.

temperatures 8 to 10 degrees below freezing in the north to about freezing in the south.

Most of the perennials common in the Northeastern States thrive here with irrigation, especially those grown in Great Britain. Succulents, such as sedums, mesembryanthemums, cacti, yuccas, irises, and native plants, grow best where there is no irrigation.

REGION 2.

Region 2 includes the Willamette Valley in Oregon and the region of similar climate north of it in Washington, including the shores of

Puget Sound. The summers are warmer and drier than in region 1 and the average lowest temperatures are from 10° to 20° F.

The perennials common in western Europe are well adapted to this region under irrigation, while succulents and native plants succeed wherever water is not available.

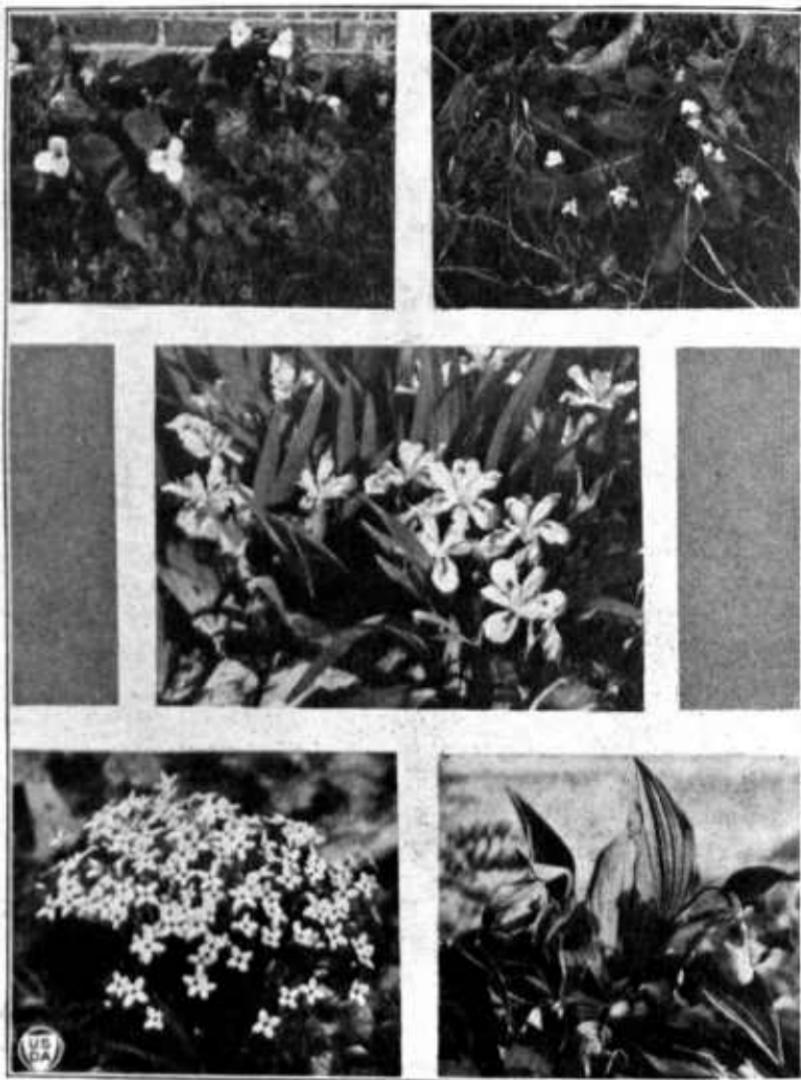


FIG. 69.—Wild garden plants. Upper left-hand corner, trilliums. Upper right-hand corner, trailing arbutus. Center, *Iris cristata*. Lower left-hand corner, bluet, or Quaker ladies. Lower right-hand corner, wild yellow ladyslipper.

REGION 3.

Region 3 includes the Sacramento and San Joaquin Valleys in California. This region has hot, dry summers and winters with 15 to 20 inches of rainfall. The temperature drops to 10 or 12 degrees

below freezing on the valley floor, with slightly higher temperatures on the hillsides.

Without irrigation succulents and plants native to regions having similar conditions are the only ones to be depended upon. With irrigation there are many more that will stand the hot sunshine and

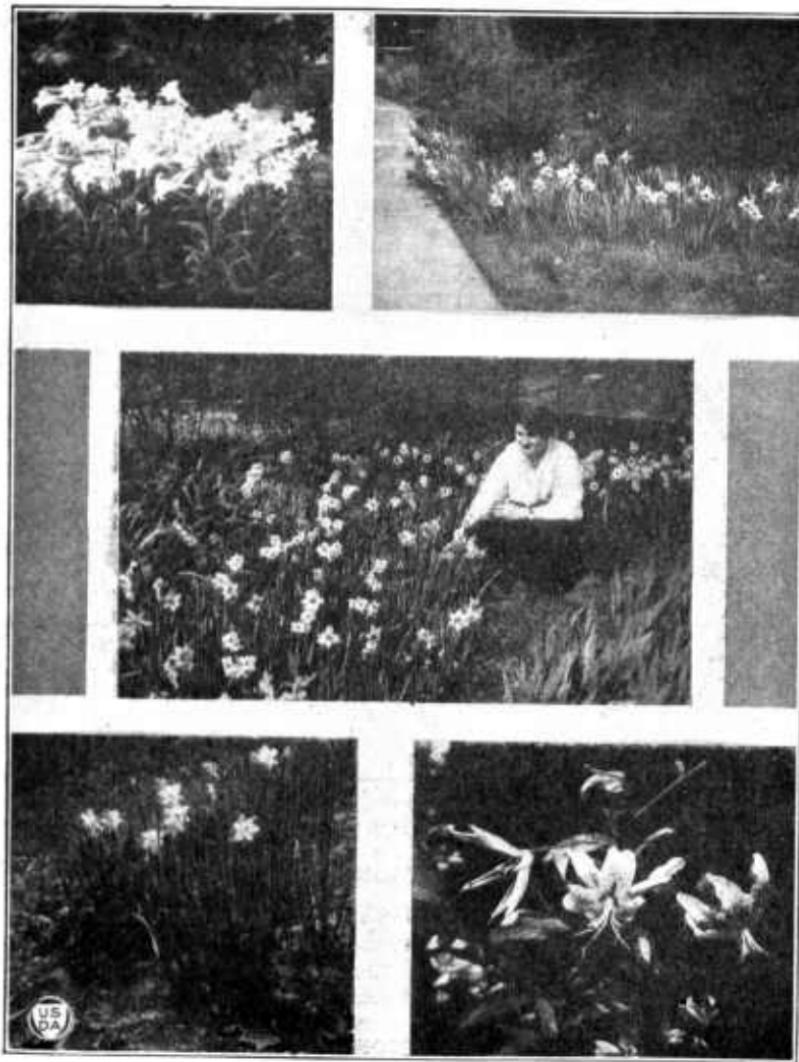


FIG. 70.—Upper left-hand corner, Japanese Easter lily. Upper right-hand corner, long trumpet narcissus. Center, poet's narcissus. Lower left-hand corner, medium trumpet narcissus. Lower right-hand corner, showy lily.

dry winds, such as columbines, delphiniums, daylilies, sunflowers, chrysanthemums, and phlox.

REGION 4.

Region 4 includes the Sierra Nevada and Cascade Ranges of mountains. Conditions here vary considerably according to ele-

vation. Many native plants grow well at the different altitudes, but at lower levels the valley plants are suitable. At a higher elevation those adapted to region 28 will succeed if irrigation water is available; if not, those suitable for region 19 will be best. For still higher elevations those listed for regions 27 and 18, respectively, are the ones to use.

REGION 5.

Region 5 comprises all that part of California from Santa Barbara to San Diego, Redlands, and Riverside, including what is popularly known as Southern California. The summers are dry, cool on the coast, and warm inland; the winters are moderately rainy, being nearly free from frost on the coast and in the foothills.

The same plants can be used here as in regions 1 and 2, and in addition many plants recognized as less hardy, such as begonias and heliotrope.

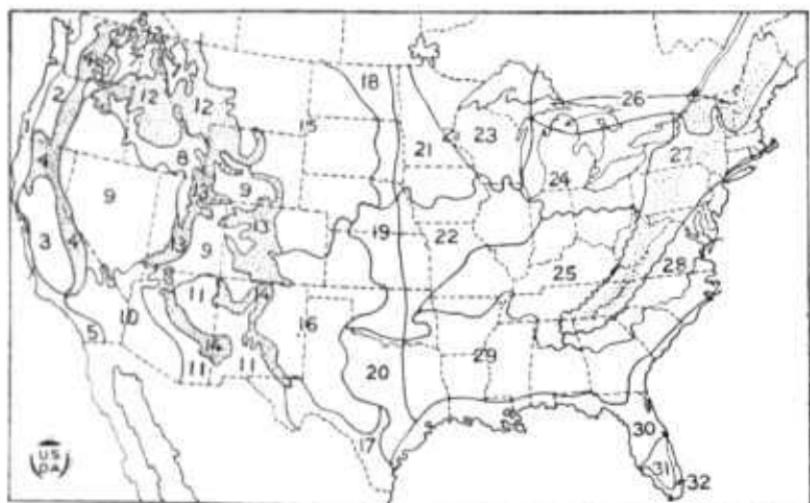


FIG. 71.—Map of the United States, showing by numbers within heavy border lines regions having approximately similar growing conditions. The stippled areas are mountain regions.

REGION 6.

Region 6 is the Columbia River Valley. The summers are warm, while the winters have temperatures of 10° to 15° F.

If supplied with water, most of the perennials succeeding in region 2 will grow here, although without water only hardy succulents should be planted.

REGION 7.

Region 7 includes the plateau of the eastern part of Washington and the valleys of Idaho and western Montana. The summers are warm, and the winter temperatures range from zero to -15° F.

Without irrigation water only the succulents, like the sedums, yuccas, and the hardiest cacti will be likely to succeed, but with water the columbines, campanulas, chrysanthemums, most delphiniums, day-lilies, irises in variety, peonies, phlox, sunflowers, heleniums, rudbeckias, and many others may be grown.

REGION 8.

Region 8 includes the Snake River Plains and the Utah Valley. It is a semiarid country with water available for irrigation. The summers are hot and the winters cold.

The same perennials that succeed in region 7 may be grown here.

REGION 9.

Region 9 is the northern part of the great arid interior plateau included in Oregon, Nevada, and Utah. Its characteristics are hot days and frosty nights in summer, with cold winters and less than 10 inches of rainfall.

Only frost-resistant plants will thrive, cacti and some other succulents where irrigation is not possible, while with irrigation most of the perennials listed for region 7 can be used.

REGION 10.

Region 10 embraces all the Southwestern Desert, including portions of California, Arizona, and a corner of Nevada. The climate is hot to scorching, with a rainfall of 3 to 10 inches.

Here again only succulents can be grown where there is no irrigation, and even with it only those plants will succeed that will stand hot sunshine with drying winds, such as sunflowers, gai-lardias, heleniums, daylilies, and many irises.

REGION 11.

Region 11 embraces the southern part of the great arid interior plateau included in New Mexico and Arizona. Its characteristics are the same as the plateau farther north (region 9), except that the temperatures are higher.

Yuccas, cacti, and other succulents are the characteristic plants and should be used. Irises, daylilies, sunflowers, rudbeckias, and chrysanthemums may be used with irrigation.

REGION 12.

Region 12 is that part of the Rocky Mountains included in Idaho, Montana, Wyoming, Washington, and Oregon. The temperature and rainfall vary greatly, dependent on elevation and exposure. Many places are suitable for a great variety of plants; others are suited to only a few.

Succulents should be used where the water supply is limited, while plants suited to regions 24 and 26 may be used where there is plenty of moisture.

REGION 13.

Region 13 includes the Rocky Mountains of Utah and Colorado. It is similar to the region farther north, except that the temperatures for the same elevation are about 7 degrees warmer. The plants that can be used at an elevation of 4,000 feet in region 12 can be used at 6,000 feet in this region.

REGION 14.

Region 14 includes the Rocky Mountains of Arizona and New Mexico. It is similar to the region farther north, except that temperatures for the same elevation average about 6 degrees warmer than region 13 and 13 degrees warmer than region 12. Allowing 4 degrees of temperature for each 1,000 feet of elevation would make

possible the growing of a particular plant in region 14 at elevations 1,500 feet higher than in region 13 when the moisture conditions are similar.

REGION 15.

Region 15 is the northern Great Plains area south to Kansas and Colorado, extending from about the 5,000-foot contour on the west to the black soils on the east. It is extremely cold in winter in the northeastern portions, usually dropping to -30° or -40° F., while close to the mountains it is 20 degrees warmer. The summers are moderately warm. This region is generally recognized as the northern part of the dry-farming area.

Only the very hardest and toughest perennials can be grown here, such as the hollyhock, the campanulas, columbines, delphiniums, *Dianthus plumarius*, *Helenium autumnale*, *Hemerocallis dumorterii*, *H. flava*, *H. fulva*, irises except the bulbous kinds, *Mammillaria missouriensis*, *M. grahamii*, *Opuntia polyacantha*, peonies, phlox of various kinds, the rudbeckias, some of the sedums, *Yucca baccata*, and *Y. harrimaniae*.

REGION 16.

Region 16 is the central portion of the Great Plains, including the plains portions of Kansas, Oklahoma, and New Mexico; also portions of the plains in Colorado and Texas. It extends eastward from about the 5,000-foot contour on the west to the black soils on the east. The rainfall varies from 10 to 20 inches. The climate is warmer and has greater evaporation than region 15. It is the southern portion of the dry-farming area.

The plants succeeding in region 15 will grow here, together with many others that do not survive so much cold but have the same ability to withstand hot dry winds.

REGION 17.

Region 17 is the dry, hot portion of southwestern Texas, with little rainfall.

Only succulents will thrive here without irrigation, while with it the same plants that succeed in region 16 can be used, as well as those that grow in region 11 under irrigation.

REGION 18.

Region 18 is the subhumid black-soils country lying just east of the dry-farming area of the northern Great Plains and is intermediate as to moisture between region 15 and the more humid area to the east of it. The winters are very cold and dry.

The same types of plants succeed here as in region 15 with a little wider range of varieties, as there is a little more moisture.

REGION 19.

Region 19 is the subhumid black-soils area of Kansas, southern Nebraska, and most of Oklahoma. There is more moisture than in the dry-farming country to the west of it and less than in the area farther east. It is a locality of sudden variation in winter temperatures and of hot winds in summer.

The plants that will succeed in region 15 will grow here, and, in addition, many more tender kinds, but owing to the dry winds the list is limited.

REGION 20.

Region 20 is the subhumid or transition region of Central Texas with black and chocolate-colored soils. In moisture conditions it is intermediate between the dry-farming regions farther west and the humid climate of eastern Texas.

In addition to the plants that thrive in region 15 the columbines, the chrysanthemums, the rosemallows or hibiscus, and all the sedums and yuccas can be cultivated successfully.

REGION 21.

Region 21 is in the northern part of the prairie country, having a short growing season with frequent droughts of more than 30 days and cold winters with drying winds. The rainfall is 20 to 30 inches, occurring mostly in the summer.

The plants that succeed here are practically the same as those that thrive in region 15.

REGION 22.

Region 22 is that portion of the prairie country having higher temperatures than region 21, but subject to similar cold drying winds in winter. The rainfall is 30 to 40 inches.

The cold dry winters prevent the successful cultivation of a large number of perennials, but those successful in region 15 with a few others thrive here.

REGION 23.

Region 23 is the western part of the Great Lakes forest area. The eastern portion is slightly warmer and more humid than the western portion, the latter much resembling region 21.

Perennials that succeed in region 21 will grow here, together with many of those that thrive in region 26.

REGION 24.

Region 24 is largely that part of the country influenced by the Great Lakes, lying east of Lake Michigan, extending south into Ohio and eastward to Lake Ontario. There is considerable moisture in the atmosphere in addition to a rainfall of 30 to 40 inches rather well distributed through the year. The winter temperatures are more moderate than in region 23, and there is usually a good snow covering giving protection to herbaceous perennials.

Nearly all the perennials adapted to cold countries do well here, as the winter snows afford an excellent mulch. These plants include many that thrive in western Europe as well as our native species. A large number are listed in northern catalogues.

REGION 25.

Region 25 includes the Ohio and lower Tennessee River valleys and the Ozark Mountain region. The winter temperatures are rather moderate with much alternate freezing and thawing, while the summer is warm with a 30-day drought often occurring near its close. The rainfall is 40 to 50 inches.

Here, too, a large number of perennials succeed, but they are somewhat different from those found in region 24, as the rock plants used in northern gardens do not thrive so well as far south. Many plants not hardy farther north will grow here.

REGION 26.

Region 26 includes the colder sections of the eastern United States, comprising much of Maine, the mountainous portions of New York, and a portion of northern Michigan. It is characterized by cold winters with heavy snowfall and short summers of long days and cool nights. The rainfall is abundant, and the heavy snows afford excellent protection to herbaceous plants.

The plants that succeed in region 27 will thrive here, as well as some alpine plants that do not grow so well farther south in low altitudes.

REGION 27.

Region 27 is the Appalachian Mountain country, including much of New England and New York, most of Pennsylvania, and the mountainous portions of the States southward. The rainfall is abundant, usually from 35 to 50 inches, and is well distributed through the season. In the colder parts the snowfall is sufficient to give abundant protection to herbaceous plants.

REGION 28.

Region 28 lies just east of region 27 and includes the Piedmont and some adjoining sections with similar growing conditions. It extends from northern Alabama northeastward across the Carolinas and Virginia to New Jersey and the coast of Massachusetts. It is warmer than region 27, with abundant rainfall except in late summer, when 30-day droughts often occur. The winters are open, with much freezing and thawing, and there is but little snow protection to be relied upon.

Many of the plants succeeding here are very different from those that grow in region 27, as the alpine and subalpine plants that thrive in the cooler climate of region 27 will not grow here, while there are many distinctively southern plants, including many bulbous ones, that succeed in this region.

REGION 29.

Region 29 includes most of the cotton country, extending from what is known as east Texas eastward and northward to the Atlantic Ocean in North Carolina and Virginia. It lies between the Piedmont region and the swampy lower coastal plain that borders the Gulf of Mexico and the Atlantic Ocean.

The rainfall is abundant, being from 45 to 60 inches except toward the last of the rather warm summer, when a 30-day drought frequently occurs.

The perennials that thrive here are those native to this locality, together with those from warm countries. Many of the plants so commonly used in regions 24 and 27 are not suited to this warmer climate, while others are admirably adapted to these conditions, among which may be mentioned many species of rosemallow, hibiscus, and erinum.

REGION 30.

Region 30 is the swampy coastal plain from Wilmington, N. C., southward along the Atlantic Ocean and westward along the Gulf of Mexico. It has moderate summer temperatures with hot sunshine, short winters, an abundance of rainfall (50 to 60 inches), and is almost subtropical.

It is the region of the palmetto and the broad-leaved evergreens. Plants whose roots would be killed by freezing and whose tops are injured by frost, such as cannas, crinums, the amaryllis, some of the tender lilies, and the tender bamboos thrive in this region. Some of the plants that succeed in cold climates also do well here, such as day-lilies, plantainlilies, and irises of many kinds.

REGION 31.

Region 31 is southern Florida, with the exception of the subtropical fringe. It is subject to annual frosts and has rather warm summers and a rainfall of over 50 inches. The vegetation approaches the subtropical, oranges, palms, and the Grevillea or silk oak succeeding.

In addition to many of the perennials suitable for regions 29 and even region 28, many of the greenhouse and tender bedding plants of the North are adapted to this region. It often becomes sufficiently cold to kill the tops of tender plants without killing their roots.

REGION 32.

Region 32 is the tropical coast of southern Florida. It has slight range of temperature with no frosts and a rainfall of 50 to 60 inches. Palms and mangroves are the typical vegetation.

The perennials are those that are grown in greenhouses in the North, such as the begonia, heliotrope, colens, and similar plants.

ADAPTABILITY OF DIFFERENT KINDS OF PLANTS.

Table 1 summarizes the principal features relating to the adaptability of different herbaceous perennials, arranged in alphabetic order, showing their suitability in regard to season of blooming, height of growth, and climatic requirements, for use in the various regions of the United States.

Column 1 gives the scientific name of the plant. The common name will be found in the index of common names. Column 2 gives the initial page where the plant is described.

Columns 3 to 7 show by means of the symbol x the time of year when the flowers may be expected. The date will vary according to latitude and altitude and to a small extent according to longitude. Thus, if the symbol appears in column 3, marked E, the blooms may be expected early in the flowering season; if in column 5, under M, about midsummer; and if in column 7, under L, just before frost. Columns 4 and 6 denote intermediate seasons.

Columns 8 to 13 show by means of the symbol x the approximate height of the plant under ordinary conditions. There will be much variation from this in many locations, depending upon the adaptability of the plants to the particular location.

Columns marked R1 to R32, under "Regions," indicate the different locations, as shown on the map (fig. 71). In these regional columns the symbol I indicates that the plant requires irrigation during the dry season; N indicates that the plant is native to the region; P indicates that special winter protection is required; X indicates that in the region thus designated the plant may be expected to thrive under average care with respect to water, shade, and other cultural conditions, including special treatment that would be required for the particular plant anywhere.

TABLE I.—Some herbaceous perennials suitable for use in the different sections of the United States.

<i>Delphinium</i> —	
<i>cardinale</i> —	
<i>cultorum</i>	x
<i>elatum</i>	x
<i>exaltatum</i>	x
<i>fissum</i>	x
<i>formosum</i>	x
<i>grandiflorum</i>	x
<i>barbatus</i>	x
<i>caryophyllus</i>	x
<i>deltoides</i>	x
<i>plumarius</i>	x
<i>plumarius semperflorens</i>	x
<i>Dicentra</i> sp.	x
<i>Dryopteris</i> —	
<i>circinalis</i>	x
<i>filixmas</i>	x
<i>novaboracense</i>	x
<i>spinulosa</i>	x
<i>spinulosa intermedia</i>	x
<i>Echinocactus</i> —	
<i>polycephalus</i>	x
<i>viridescens</i>	x
<i>Echinocereus rigidissimus</i>	x
<i>Erythronium</i> sp.	x
<i>Eulalia</i> —	
<i>gracillima</i>	x
<i>uniflora</i>	x
<i>praeclitima uniflora</i>	x
<i>Funkia</i> . See <i>Nioche</i> .	
<i>Gentiana</i> sp.	x
<i>gyneritum argenteum</i> (Cortaderia argentea)	x
<i>Gormania organum</i>	x
<i>Helenium</i> —	
<i>autumnale</i>	x
<i>hoopesii</i>	x
<i>Helianthus</i> —	
<i>decapetalus</i>	x
<i>rigidus</i>	x
<i>Hemerocallis</i> —	
<i>aurantiaca</i>	x
<i>dumortieri</i>	x
<i>lilio-asphodelus</i>	x
<i>fulva</i>	x
<i>Thunbergii</i>	x
<i>Hibiscus</i> —	
<i>coccineus</i>	x
<i>lasiocarpus</i>	x
<i>militaris</i>	x
<i>mosebentus</i>	x

TABLE 1.—*Some herbaceous perennials suitable for use in the different sections of the United States—Continued.*

Scientific name of plant.	Reference page.	Season.					Height (feet).	Regions. [Reference is made to the map (fig. 71).]																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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Reed, giant.	<i>Arimo</i> .	68	Oregon.	<i>Gormania Oregonia</i> .	51
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Riverton Gem.	do.	61	running.	<i>Sedum stoloniferum</i> .	52
Rosemallow.	<i>Hibiscus moscheutos</i> .	63	scarlet running.	<i>Sedum stoloniferum</i> .	52
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Roseroot stonecrop.	<i>Sedum roseum</i> .	52	Striped eulalia.	<i>Sedum sieboldii</i> .	52
Royal fern.	<i>Osmunda regalis</i> .	71	Sunflower.	<i>Miscanthus sinensis</i> .	68
Rudbeckia.		58	Miss Mellish.	<i>variegatus</i> .	
Rue anemone.	<i>Syndesmon thalictroides</i> .	67	Soleil d'Or.		
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Sage, scarlet.		3	Sweet-william.		
Scarlet running stonecrop.	<i>Sedum stoloniferum</i> .	52	wild.		
Seilla.		73	Tawny daylily.		
Scottish pink.	<i>Dianthus plumarius</i> .	40	Thread, Adam's.		
Sedum.		50	needle-and.		
Shasta daisy.	<i>Chrysanthemum maximum</i> .	34	Trailing arbutus.		
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Siberian iris.	<i>Sedum spectabile</i> .	53	Violet.		
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Beauty.	do.	61	Walking fern.		
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			iris, common.		
			water iris.		
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			Zebra grass.		
			Zinnia.		3

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February 15, 1924.

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